PBEEEP
State Government

Public Buildings Enhanced Energy Efficiency Program

Final Report
Investigation Results For
Hibbing Community College

Date: 6/7/2012

Table of Contents

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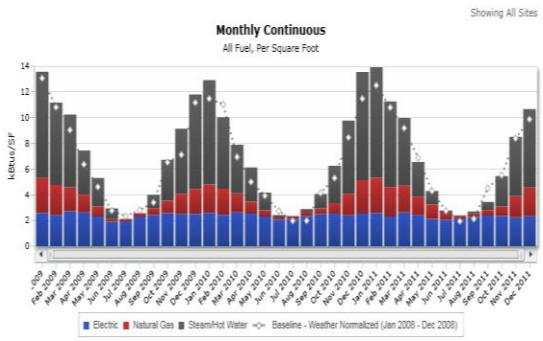
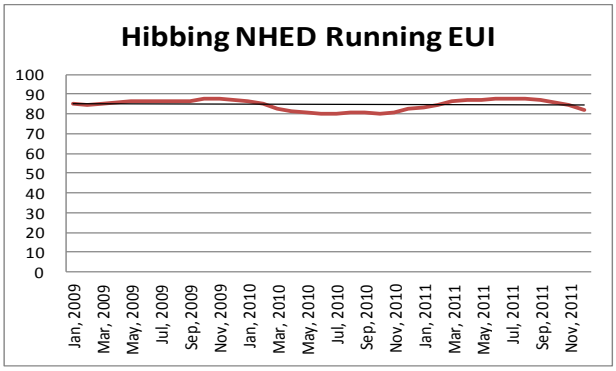
Hibbing Community College Energy Investigation Overview

The goal of a PBEEEP Energy Investigation is to identify energy savings opportunities with a payback of fifteen years or less. Particular emphasis is on finding those opportunities that will generate savings with a relatively fast (1 to 5 years) and certain payback. During the investigation phase the provider conducts a rigorous analysis of the building operations. Through observation, targeted functional testing, and analysis of extensive trend and portable logger data, the RCx Provider identifies deficiencies in the operation of the mechanical equipment, lighting, envelope, and related controls. The investigation of Hibbing Community College was performed by Karges Faulconbridge, Inc. This report is the result of that information.

Payback Information and Energy Savings				
Total project costs (Without Co-funding)			**Project costs with Co-funding**	
Total costs to date including study	$74,218		Total Project Cost	$87,573
Future costs including Implementation , Measurement & Verification	$13,355		Study and Administrative Cost Paid with ARRA Funds	($77,218)
Total Project Cost	$87,573		Utility Co-funding	$0
			Total costs after co-funding	$10,355
Estimated Annual Total Savings ($)	$21,398		Estimated Annual Total Savings ($)	$21,398
Total Project Payback	4.1		Total Project Payback with co-funding	0.5
Electric Energy Savings	**3.3 %**	**and**	**District Energy Savings**	**7.7 %**





Year	Days	SF	Total kBtu	Normalized Baseline kBtu	Change from Baseline kBtu	% Change	Total Energy Cost $	Average Cost Rate $ /kBtu
2009	365	362,583	31,536,840	29,016,682	2,520,158	9%	$567,158.63	$0.02
2010	365	362,583	29,883,114	27,005,831	2,877,284	11%	$546,576.42	$0.02
2011	365	362,583	29,699,219	28,565,381	1,133,838	4%	$529,008.89	$0.02

Hibbing Community College Consumption Report
Total energy use decreased 14% during the period of the investigation

STATE OF MINNESOTA B3 BENCHMARKING

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Summary Tables

Hibbing Community College	
Location	1515 E 25th St Hibbing, MN 55746
Facility Manager	Jimmer Hodge
Interior Square Footage	362,582; 237,217 included in investigation
PBEEEP Provider	Karges Faulconbridge, Inc.
Project Manager	Keith Harvey, Director of Finance and Facilities
Annual Energy Cost	$529,009 (2011) Source: B3
Utility Company	Hibbing Public Utilities (Electric, Natural Gas, and Steam)
Site Energy Use Index (EUI)	88 kBtu/ft^2 (at start of study) 75 kBtu/ft^2 (at end of study)
Benchmark EUI (from B3)	163 kBtu/ft^2
Benchmark EUI (from CEE)	102 kBtu/ft^2

Building Name	State ID	Square Footage	Year Built
Building A,B,C	E26258T1201	139,596	2001
Chiller Room (BLDG U)	E26143C0467	2,714	1967
Athletics/Big Gym/Boiler room	E26143C0569	19,304	1969
Electrical Room East (BLDG U)	E26258T0693	2,280	1988
Fine Arts (BLDG F)	E26143C0671	27,876	1971
Heating Plant Addition(BLDG U)	E26258T0799	1,856	1999
Campus Center (BLDG G)	E26143C0774	12,370	1974
Phy Ed. Small Gym (BLDG PE)	E26143C1088	12,701	1988
Administration (BLDG M)	E26143C0167	12,520	1967
Maintenance Bldg (BLDG 1)	E26258T0893	6,000	1983

Mechanical Equipment Summary Table (of buildings included in the investigation)	
Quantity	**Equipment Description**
2	Building Automation System (Honeywell and iNet 7)
10	Buildings
237,217	Interior Square Feet
13	Air Handlers
265	VAV Boxes
37	Fan powered VAV boxes
3	FCUs
1	Steam to Water Heat Exchangers
3	Hot Water Pumps
3	Chilled Water Pumps
3	Dry Coolers
4	VUHs
7	Exhaust Fans
800	Points Available for Trending
660	Minimum Points to Trend
	No data loggers required (Does NOT include lighting loggers)

Implementation Information			
Estimated Annual Total Savings ($)			$21,398
Total Estimated Implementation Cost ($)			$10,355
GHG Avoided in U.S Tons (CO2e)			178
Electric Energy Savings (kWh) 3.3 % Savings 2011 Electric Usage 2,958,354 kWh (from B3)			98,453
Electric Demand Savings (Peak kW)			5
District Energy Savings (MMBtu) 7.7 % Savings 2011 Usage 13,910 MMBtu from B3			1,075
Statistics			
Number of Measures identified			12
Number of Measures with payback < 3 years			10
Screening Start Date	2/23/2011	Screening End Date	8/29/2011
Investigation Start Date	11/3/2011	Investigation End Date	3/02/2012
Final Report	6/7/2012		

Hibbing Community College Cost Information		
Phase	**To date**	**Estimated**
Screening	$5,538	
Investigation [Provider]	$63,080	
Investigation [CEE]	$5,600	$1,000
Implementation		$10,355
Implementation [CEE]		$1000
Measurement & Verification	0	$1000
Total	$74,218	$13,355

Co-funding Summary	
Study and Administrative Cost	$77,218
Utility Co-Funding - Estimated Total ($)	$
Total Co-funding ($)	$77,218

Facility Overview

The energy investigation identified 5.1% of total energy savings at Hibbing Community College with measures that payback in less than 15 years and do not adversely affect occupant comfort. The energy savings opportunities identified at Hibbing Community College are based on adjusting the schedule of equipment to match actual building occupancy hours, adjusting set points, and replacing 32 W lamps with 28 W lamps wherever possible. The total cost of implementing all the measures is $10,355.

Implementing all these measures can save the facility approximately $21,398 a year with a combined payback period of 6 months based on the implementation cost only (excluding study and administrative costs). These measures will produce 3.3 % electrical savings and 7.7 % district energy (steam) savings. The campus energy use dropped about 14% over the period of the study.

The primary energy intensive systems at Hibbing Community College are described here:

The Hibbing Community College campus consists of 22 buildings totaling 362,582 square feet (sq ft) located in Hibbing, MN. Most of the buildings are interconnected and contain college classrooms. Ten buildings on this site with 237,217 square feet were included in the energy investigation.

Mechanical Equipment

Heating Plant

The heat throughout the campus comes from district steam and gets converted to hot water in the U-building. There is a single boiler that is used for backup only. The hot water is pumped around the campus using three 10hp, 600 GPM pumps, serving all buildings on campus. Each building has its own hot water pump to deliver heat to units in the building.

Cooling Plant

Only about half of the campus is cooled. The ABC buildings are all fully cooled using chilled water, while some rooms in other buildings have supplemental cooling using DX units. The chilled water is produced by a 400 Ton York Variable Speed Centrifugal Chiller with a 40hp cooling tower. The chilled water is pumped to the ABC buildings with a single 60hp, 800 GPM pump. The cooling tower water is pumped by a 40hp, 1,260 GPM pump.

ABC Buildings - Automotive, Electrical, Law Enforcement, Administration, Commons, etc.

The ABC buildings were constructed in 2001 and are the newest buildings on campus. All the HVAC equipment is located in penthouses. The systems are VAV AHUs and CV MAUs.

D Building - Math, Science, etc.

The math and science building is getting new HVAC and is therefore excluded from this study.

E Building - Ceramics

The ceramics building has very small hot water air handler. The unit has a coil pump for hot water delivery.

Planetarium

The Planetarium is used only on special occasions and only conditioned when occupied. This building is excluded from the study because the low hours of use.

Controls and Trending
There are two different BAS at Hibbing CC. The ABC buildings have a Honeywell system while the others have an Inet7 system. Both systems are hosted on desk top computers which are probably ten years old and have inadequate capacity to properly run the software, as a result they lock up frequently. The Honeywell computer does not have a USB port, so floppy disks are the only current alternative. The state plans to upgrade these computers, possibly prior to the start of the study.
The iNet7 system is a great trending system and should not have any problems trending any desirable point. The Honeywell system should also be capable of trending.

Lighting
Indoor lighting- Interior lighting primarily consists of T8 32W lights, but some T12 lighting remains. Most classroom lights are operated by a manual switches.

Outdoor lighting- The outdoor lighting consists of parking lot lighting, side walk lights and some decorative lighting. Some of the lighting is on the BAS and is operated using schedules and daylight sensors.

Energy Use Index B3 Benchmark
At the start of the study the site Energy Use Index (EUI) for the building is 87.7 kBtu/sq ft, which is 46% lower than the B3 Benchmark of 163 kBtu/sq ft. The benchmark value is inflated by incorrect space use specified in B3. The actual benchmark value, based on CEE's analysis, should be closer to 102 kBtu/sq ft. (see attachment in this report). The site EUI started at 14% below this value and ended at 26% below the benchmark. The site EUIs for State of Minnesota buildings are 23% lower than their corresponding B3 Benchmarks on average.

Metering
The campus has four electrical meters, one steam meter for district steam, and five natural gas meters. The dormitories are the only buildings that are metered completely separately. The ABC buildings have their own gas meter, but share the main campus electrical meter. The backup boilers have their own gas meter, so finding boiler energy use will be straight forward. The rest of the buildings share the main campus electric and natural gas meter.

Findings Summary

Site: NHED Hibbing

Eco #	Building	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
1	Building A,B,C	Unit Run Time	$100	$4,487	0.02	$0	0.02	37
1	Campus Center (Bldg G)	UNIT RUN TIMES	$100	$4,649	0.02	$0	0.02	43
1	Fine Arts (Bldg F)	Unit Run Times	$100	$1,979	0.05	$0	0.05	19
1	Hibbing Administration (Bldg M)	Unit Run Time	$200	$1,741	0.11	$0	0.11	14
3	Building A,B,C	Exhaust Fan Control	$500	$3,689	0.14	$0	0.14	27
2	Building A,B,C	Set Point Adjustments	$500	$1,611	0.31	$0	0.31	13
3	Hibbing Administration (Bldg M)	AHU-1 Simultaneous Heating and Cooling	$1,000	$724	1.38	$0	1.38	5
4	Building A,B,C	Lighting Retrofit	$4,065	$1,535	2.65	$0	2.65	13
1	Phy Ed/Small Gym (Bldg PE)	Lighting Upgrade	$420	$154	2.73	$0	2.73	1
1	Maintenance Bldg (Bldg 1)	Lighting Upgrade	$630	$226	2.79	$0	2.79	2
2	Hibbing Administration (Bldg M)	Lighting	$1,060	$349	3.03	$0	3.03	3
2	Fine Arts (Bldg F)	Lighting Upgrade	$1,680	$253	6.64	$0	6.64	2
		Total for Findings with Payback 3 years or less:	**$7,615**	**$20,796**	**0.37**	**$0**	**0.37**	**173**
		Total for all Findings:	**$10,355**	**$21,398**	**0.48**	**$0**	**0.48**	**178**

NHED_Hibbing

Finding Type Number	Finding Type	Relevant Findings	Looked for, not found	Not relevant
a.1 (1)	Time of Day enabling is excessive	4	2	
a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	4	2	
a.3 (3)	Lighting is on more hours than necessary.		2	4
a.4 (4)	OTHER_Equipment Scheduling/Enabling		4	2
b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed			6
b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction		3	3
b.3 (7)	OTHER_Economizer/OA Loads		1	5
c.1 (8)	Simultaneous Heating and Cooling is present and excessive		6	
c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement		6	
c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints		6	
c.4 (11)	OTHER_Controls	1		5
d.1 (12)	Daylighting controls or occupancy sensors need optimization.		1	5
d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.		5	1
d.3 (14)	Fan Speed Doesn't Vary Sufficiently		1	5
d.4 (15)	Pump Speed Doesn't Vary Sufficiently		1	5
d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary		1	5
d.6 (17)	Other_Controls (Setpoint Changes)	1	1	4
e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal		2	4
e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal			6
e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal		1	5
e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal		1	5

e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal			6
e.6 (22)	Other_Controls (Reset Schedules)		1	5
f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit	1		5
f.2 (24)	Pump Discharge Throttled			6
f.3 (25)	Over-Pumping			6
f.4 (26)	Equipment is oversized for load.			6
f.5 (27)	OTHER_Equipment Efficiency/Load Reduction			6
g.1 (28)	VFD Retrofit - Fans			6
g.2 (29)	VFD Retrofit - Pumps			6
g.3 (30)	VFD Retrofit - Motors (process)			6
g.4 (31)	OTHER_VFD			6
h.1 (32)	Retrofit - Motors			6
h.2 (33)	Retrofit - Chillers			6
h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)			6
h.4 (35)	Retrofit - Boilers			6
h.5 (36)	Retrofit - Packaged Gas fired heating			6
h.6 (37)	Retrofit - Heat Pumps			6
h.7 (38)	Retrofit - Equipment (custom)			6
h.8 (39)	Retrofit - Pumping distribution method			6
h.9 (40)	Retrofit - Energy/Heat Recovery		2	4
h.10 (41)	Retrofit - System (custom)			6
h.11 (42)	Retrofit - Efficient Lighting	5		1
h.12 (43)	Retrofit - Building Envelope			6
h.13 (44)	Retrofit - Alternative Energy			6
h.14 (45)	OTHER_Retrofit			6
i.1 (46)	Differed Maintenance from Recommended/Standard		2	4

i.2 (47)	Impurity/Contamination			6
i.3 ( )	Leaky/Stuck Damper	1	3	2
i.4 ( )	Leaky/Stuck Valve		1	5
i.5 (48)	OTHER_Maintenance	3		3
j.1 (49)	OTHER	1		5

Findings Glossary: Examples of Common Findings Details (Reference)

a.1 (1)	**Time of Day enabling is excessive**
	• HVAC running when building is unoccupied. Equipment schedule doesn't follow building occupancy • Optimum start-stop is not implemented • Controls in hand
a.2 (2)	**Equipment is enabled regardless of need, or such enabling is excessive**
	• Fan runs at 2" static pressure. Lowering pressure to 1.8" does not create comfort problem and the flow is per design. • Supply air temperature and pressure reset: cooling and heating
a.3 (3)	**Lighting is on more hours than necessary**
	• Lighting is on at night when the building is unoccupied • Photocells could be used to control exterior lighting • Lighting controls not calibrated/adjusted properly
a.4 (4)	**OTHER Equipment Scheduling and Enabling**
	• Please contact PBEEEP Project Engineer for approval
b.1 (5)	**Economizer Operation – Inadequate Free Cooling**
	• Economizer is locked out whenever mechanical cooling is enabled (non-integrated economizer) • Economizer linkage is broken • Economizer setpoints could be optimized • Plywood used as the outdoor air control • Damper failed in minimum or closed position
b.2 (6)	**Over-Ventilation**
	• Demand-based ventilation control has been disabled • Outside air damper failed in an open position • Minimum outside air fraction not set to design specifications or occupancy
b.3 (7)	**OTHER Economizer/Outside Air Loads**
	• Please contact PBEEEP Project Engineer for approval
c.1 (8)	**Simultaneous Heating and Cooling is present and excessive**
	• For a given zone, CHW and HW systems are unnecessarily on and running simultaneously • Different setpoints are used for two systems serving a common zone
c.2 (9)	**Sensor / Thermostat needs calibration, relocation / shielding, and/or replacement**
	• OAT temperature is reading 5 degrees high, resulting in loss of useful economizer operation • Zone sensors need to be relocated after tenant improvements • OAT sensor reads high in sunlight
c.3 (10)	**Controls "hunt" / need Loop Tuning or separation of heating/cooling setpoints**
	• CHW valve cycles open and closed • System needs loop tuning – it is cycling between heating and cooling
c.4 (11)	**OTHER Controls**
	• Please contact PBEEEP Project Engineer for approval
d.1 (12)	**Daylighting controls or occupancy sensors need optimization**
	• Existing controls are not functioning or overridden • Light sensors improperly placed or out of calibration
d.2 (13)	**Zone setpoint setup / setback are not implemented or are sub-optimal**
	• The cooling setpoint is 74 ºF 24 hours per day
d.3 (14)	**Fan Speed Doesn't Vary Sufficiently**
	• Fan runs at 2" static pressure. Lowering pressure to 1.8" does not create comfort problem and the flow is per design. • Supply air temperature and pressure reset: cooling and heating

d.4 (15)	**Pump Speed Doesn't Vary Sufficiently**
	• Pump runs at 15 PSI on peak day. Lowering pressure to 12 does not create comfort problem and the flow is per design. Low ΔT across the chiller during low load conditions.
d.5 (16)	**VAV Box Minimum Flow Setpoint is higher than necessary**
	• Boxes universally set at 40%, regardless of occupancy. Most boxes can have setpoints lowered and still meet minimum airflow requirements.
d.6 (17)	**Other Controls (Setpoint Changes)**
	• Please contact PBEEEP Project Engineer for approval
e.1 (18)	**HW Supply Temperature Reset is not implemented or is sub-optimal**
	• HW supply temperature is a constant 180 ºF. It should be reset based on demand, or decreased by a reset schedule as OAT increases. • DHW Setpoints are constant 24 hours per day
e.2 (19)	**CHW Supply Temperature Reset is not implemented or is sub-optimal**
	• CHW supply temperature is a constant 42 ºF. It could be reset, based on demand or ambient temperature.
e.3 (20)	**Supply Air Temperature Reset is not implemented or is sub-optimal**
	• The SAT is constant at 55 ºF. It could be reset to minimize reheat and maximize economizer cooling. The reset should ideally be based on demand (e.g., looking at zone box damper positions), but could also be reset based on OAT.
e.4 ( )	**Supply Duct Static Pressure Reset is not implemented or is suboptimal**
	• The Duct Static Pressure (DSP) is constant at 1.5" wc. It could be reset to minimize fan energy. The reset should ideally be based on demand (e.g. looking at zone box damper positions), but could also be reset based on OAT.
e.5 (21)	**Condenser Water Temperature Reset is not implemented or is sub-optimal**
	• CW temperature is constant leaving the tower at 85 ºF. The temperature should be reduced to minimize the total energy use of the chiller and tower. It may be worthwhile to reset based on load and ambient conditions.
e.6 (22)	**Other Controls (Reset Schedules)**
	• Please contact PBEEEP Project Engineer for approval
f.1 (23)	**Lighting system needs optimization - Spaces are overlit**
	• Lighting exceeds ASHRAE or IES standard levels for specific space types or tasks
f.2 (24)	**Pump Discharge Throttled**
	• The discharge valve for the CHW pump is 30% open. The valve should be opened and the impeller size reduced to provide the proper flow without throttling.
f.3 (25)	**Over-Pumping**
	• Only one CHW pump runs when one chiller is running. However, due to the reduced pressure drop in the common piping, the pump is providing much greater flow than needed.
f.4 (26)	**Equipment is oversized for load**
	• The equipment cycles unnecessarily • The peak load is much less than the installed equipment capacity

f.5 (27)	**OTHER Equipment Efficiency/Load Reduction**
	• Please contact PBEEEP Project Engineer for approval
g.1 (28)	**VFD Retrofit Fans**
	• Fan serves variable flow system, but does not have a VFD. • VFD is in override mode, and was found to be not modulating.
g.2 (29)	**VFD Retrofit - Pumps**
	• 3-way valves are used to maintain constant flow during low load periods. • Only one CHW pumps runs when one chiller is running. However, due to the reduced pressure drop in the common piping, the pump is providing much greater flow than needed.
g.3 (30)	**VFD Retrofit - Motors (process)**
	• Motor is constant speed and uses a variable pitch sheave to obtain speed control.
g.4 (31)	**OTHER VFD**
	• Please contact PBEEEP Project Engineer for approval
h.1 (32)	**Retrofit - Motors**
	• Efficiency of installed motor is much lower than efficiency of currently available motors
h.2 (33)	**Retrofit - Chillers**
	• Efficiency of installed chiller is much lower than efficiency of currently available chillers
h.3 (34)	**Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)**
	• Efficiency of installed air conditioner is much lower than efficiency of currently available air conditioners
h.4 (35)	**Retrofit - Boilers**
	• Efficiency of installed boiler is much lower than efficiency of currently available boilers
h.5 (36)	**Retrofit - Packaged Gas-fired heating**
	• Efficiency of installed heaters is much lower than efficiency of currently available heaters
h.6 (37)	**Retrofit - Heat Pumps**
	• Efficiency of installed heat pump is much lower than efficiency of currently available heat pumps
h.7 (38)	**Retrofit - Equipment (custom)**
	• Efficiency of installed equipment is much lower than efficiency of currently available equipment
h.8 (39)	**Retrofit - Pumping distribution method**
	• Current pumping distribution system is inefficient, and could be optimized. • Pump distribution loop can be converted from primary to primary-secondary)
h.9 (40)	**Retrofit - Energy / Heat Recovery**
	• Energy is not recouped from the exhaust air. • Identification of equipment with higher effectiveness than the current equipment.
h.10 (41)	**Retrofit - System (custom)**
	• Efficiency of installed system is much lower than efficiency of another type of system
h.11 (42)	**Retrofit - Efficient lighting**
	• Efficiency of installed lamps, ballasts or fixtures are much lower than efficiency of currently available lamps, ballasts or fixtures.

h.12 (43)	**Retrofit - Building Envelope**
	• Insulation is missing or insufficient • Window glazing is inadequate • Too much air leakage into / out of the building • Mechanical systems operate during unoccupied periods in extreme weather
h.13 (44)	**Retrofit - Alternative Energy**
	• Alternative energy strategies, such as passive/active solar, wind, ground sheltered construction or other alternative, can be incorporated into the building design
h.14 (45)	**OTHER Retrofit**
	• Please contact PBEEEP Project Engineer for approval
i.1 (46)	**Differed Maintenance from Recommended/Standard**
	• Differed maintenance that results in sub-optimal energy performance. • Examples: Scale buildup on heat exchanger, broken linkages to control actuator missing equipment components, etc.
i.2 (47)	**Impurity/Contamination**
	• Impurities or contamination of operating fluids that result in sub-optimal performance. Examples include lack of chemical treatment to hot/cold water systems that result in elevated levels of TDS which affect energy efficiency.
i.3 ( )	**Leaky/Stuck Damper**
	• The outside or return air damper on an AHU is leaking or is not modulating causing the energy use go up because of additional load to the central heating and/or cooling plant.
i.4 ( )	**Leaky/Stuck Valve**
	• The heating or cooling coil valve on an AHU is leaking or is not modulating causing the energy use go up because of additional load to the central heating and/or cooling plant.
i.5 (48)	**OTHER Maintenance**
	• Please contact PBEEEP Project Engineer for approval
j.1 (49)	**OTHER**
	• Please contact PBEEEP Project Engineer for approval

Findings Summary

Building: Building A,B,C
Site: NHED Hibbing

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
1	Unit Run Time	$100	$4,487	0.02	$0	0.02	37
3	Exhaust Fan Control	$500	$3,689	0.14	$0	0.14	27
2	Set Point Adjustments	$500	$1,611	0.31	$0	0.31	13
4	Lighting Retrofit	$4,065	$1,535	2.65	$0	2.65	13
	Total for Findings with Payback 3 years or less:	**$5,165**	**$11,322**	**0.46**	**$0**	**0.46**	**89**
	Total for all Findings:	**$5,165**	**$11,322**	**0.46**	**$0**	**0.46**	**89**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

PBEEEP State Government

Building: Building A,B,C

FWB Number:	15601	Eco Number:	1
Site:	NHED Hibbing	Date/Time Created:	5/10/2012

Investigation Finding:	Unit Run Time	Date Identified:	2/14/2012
Description of Finding:	Units run longer than the building is occupied. Trends show 24 hours for the period that was recorded. AHU-4 and AHU-5 affected. We only looked at heating hours below 41 degrees. Obviously this would carry over to summer. Did not look at running numbers for summer savings but they should be inherent.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Time of Day enabling is excessive		

Implementer:	Controls Contractor
Benefits:	Reduced fan and ventialiton load
Baseline Documentation Method:	Trend data
Measure:	Correct the unit scheduling from 24 hour per day operation to Sat/Sun 10-5 and 6 am to 10 pm Mon-Friday
Recommendation for Implementation:	The controls contractor changes the schedule on the next visit or Jimmer can do this himself. Set schedule to Sat/Sun 10-5 and Mon-Fir 6am-10pm.
Evidence of Implementation Method:	Trend the unit's Supply Fan and verify the schedules.

Annual Electric Savings (kWh):	16,870	Annual District Energy-Steam Savings (kBtu):	260,591
Estimated Annual kWh Savings ($):	$1,282	Est Annual District Energy-Steam Savings ($):	$3,205
Contractor Cost ($):	$100		
PBEEEP Provider Cost for Implementation Assistance ($):	$0		
Total Estimated Implementation Cost ($):	$100		

Estimated Annual Total Savings ($):	$4,487	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.02	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.02	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	37	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	21.0%	Percent of Implementation Costs:	1.0%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Building A,B,C

FWB Number:	15601	Eco Number:	2
Site:	NHED Hibbing	Date/Time Created:	5/10/2012

Investigation Finding:	Set Point Adjustments	Date Identified:	2/14/2012
Description of Finding:	AHU-2 and 3 are have discharge air temperatures that are low during unoccupied times. The OA dampers show closed but the mixed air temps and DAT's compared to the RAT's indicate the unit is bringing in OA to maintain the set point. The unit should not come on to cool spaces during the winter.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Other Equipment Scheduling/Enabling		

Implementer:	Controls Contractor
Benefits:	Reduced fan and ventialiton load
Baseline Documentation Method:	Trend Data
Measure:	The unit should not be enabled during winter operation for cooling purposes during unoccupied times in this location. Let temperatures float at night for cooling purposes.
Recommendation for Implementation:	Controls contractor correct programming and allow the units only to cycle on for heating when cooling is locked out.
Evidence of Implementation Method:	Trend the unit's Supply Fan, MAT, DAT, RAT, OA Damper and Zone Temperatures. Verify that unit does not cool at night when cooling is locked out.

Annual Electric Savings (kWh):	3,541	Annual District Energy-Steam Savings (kBtu):	109,106
Estimated Annual kWh Savings ($):	$269	Est Annual District Energy-Steam Savings ($):	$1,342
Contractor Cost ($):	$500		
PBEEEP Provider Cost for Implementation Assistance ($):	$0		
Total Estimated Implementation Cost ($):	$500		

Estimated Annual Total Savings ($):	$1,611	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.31	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.31	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	13	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	7.5%	Percent of Implementation Costs:	4.8%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

PBEEEP State Government

Building: Building A,B,C

FWB Number:	15601	Eco Number:	3
Site:	NHED Hibbing	Date/Time Created:	5/10/2012

Investigation Finding:	Exhaust Fan Control	Date Identified:	2/14/2012
Description of Finding:	Exhaust fans run longer than necessary. Many of these are manual control but some are scheduled. Run fans Sat/Sunday from 10 am - 4 pm and Mon-Fri 6 am-10pm. Only looked at the one hour trends. Difficult to estimate the manual control fans. Fan shut down should be placed on the closeout procedures. Obviously some were just forgotten.		
Equipment or System(s):	Other	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Equipment is enabled regardless of need, or such enabling is excessive		

Implementer:	HCC/ controls contractor	Benefits:	Reduced make up air and fan run time.
Baseline Documentation Method:	Trend data		
Measure:	Add manual fans to checkout proceedures and schedule all automated fans to match the air handling units.		
Recommendation for Implementation:	Create checkout sheets for all manual fans that are to be turned off by HCC staff and at what time. Schedule all other fans on the BAS to operate only during occupied hours. Set schedule to Sat/Sun 10-5 and Mon-Fir 6am-10pm.		
Evidence of Implementation Method:	Trend log the fans as we have and verify they are operating only when required.		

Annual Electric Savings (kWh):	1,448	Annual District Energy-Steam Savings (kBtu):	290,953
Estimated Annual kWh Savings ($):	$110	Est Annual District Energy-Steam Savings ($):	$3,579
Contractor Cost ($):	$500		
PBEEEP Provider Cost for Implementation Assistance ($):	$0		
Total Estimated Implementation Cost ($):	$500		

Estimated Annual Total Savings ($):	$3,689	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.14	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.14	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	27	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	17.2%	Percent of Implementation Costs:	4.8%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Building A,B,C

FWB Number:	15601	Eco Number:	4
Site:	NHED Hibbing	Date/Time Created:	5/10/2012

Investigation Finding:	Lighting Retrofit	Date Identified:	2/14/2012
Description of Finding:	Replace T8 32 W lamps with 28 W lamps.		
Equipment or System(s):	Interior Lighting	Finding Category:	Retrofits
Finding Type:	Retrofit - Efficient Lighting		

Implementer:	HCC	Benefits:	Reduced lighting power
Baseline Documentation Method:	Lighting counts. Recorded lamp Wattages. Operational hours.		
Measure:	Replace 32 W T8 Lamps with 28 W lamps as they burn out. We have seen this done piece meal and there is no noticeable difference between fixtures. Suggest changing both lamps out in two lamp fixtures but probably not necessary.		
Recommendation for Implementation:	Install piecemeal as lights burn out and cost to implement goes to zero or replace all at once. Cost it figured in for total replacement. Suggest starting with a few lamps prior to purchasing large numbers. Verfy lighting is acceptable prior to making large investment. Ballasts that we were shown list 28 W as acceptable Wattages.		
Evidence of Implementation Method:	Verify installations. Provide work orders, reciepts, pictures, etc. as proof that work has been completed.		

Annual Electric Savings (kWh):	14,949	Peak Demand Savings (kWh):	3
Estimated Annual kWh Savings ($):	$1,136	Estimated Annual Demand Savings ($):	$399
Contractor Cost ($):	$4,065		
PBEEEP Provider Cost for Implementation Assistance ($):	$0		
Total Estimated Implementation Cost ($):	$4,065		

Estimated Annual Total Savings ($):	$1,535	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	2.65	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	2.65	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	13	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	7.2%	Percent of Implementation Costs:	39.3%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Summary

Building: Fine Arts (Bldg F)
Site: NHED Hibbing

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
1	Unit Run Times	$100	$1,979	0.05	$0	0.05	19
2	Lighting Upgrade	$1,680	$253	6.64	$0	6.64	2
	Total for Findings with Payback 3 years or less:	**$100**	**$1,979**	**0.05**	**$0**	**0.05**	**19**
	Total for all Findings:	**$1,780**	**$2,232**	**0.80**	**$0**	**0.80**	**21**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Fine Arts (Bldg F)

FWB Number:	15602	Eco Number:	1
Site:	NHED Hibbing	Date/Time Created:	5/10/2012

Investigation Finding:	Unit Run Times	Date Identified:	2/14/2012
Description of Finding:	Units run longer than building is occupied.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Time of Day enabling is excessive		

Implementer:	controls contractor	Benefits:	reduce fan run time and ventilation conditioning
Baseline Documentation Method:	Trending shows the units run longer than actual building hours		
Measure:	Correct equipment run times on the schedules.		
Recommendation for Implementation:	Correct the schedules to match actual building operation. Run AHU3 and 4 from 10 am until 4 Saturday and Sunday. Run from 6 am until 8 pm Mon-Friday		
Evidence of Implementation Method:	Verify schedules and trend Supply Fan Status to verify scheduled operation. Provide work orders or paid invoices of work completed. Check bi-monthly to ensure schedules remain in place.		

Annual Electric Savings (kWh):	15,839	Annual District Energy-Steam Savings (kBtu):	63,057
Estimated Annual kWh Savings ($):	$1,204	Est Annual District Energy-Steam Savings ($):	$776
Contractor Cost ($):	$100		
PBEEEP Provider Cost for Implementation Assistance ($):	$0		
Total Estimated Implementation Cost ($):	$100		

Estimated Annual Total Savings ($):	$1,979	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.05	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.05	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	19	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	9.3%	Percent of Implementation Costs:	1.0%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Fine Arts (Bldg F)

FWB Number:	15602	Eco Number:	2
Site:	NHED Hibbing	Date/Time Created:	5/10/2012

Investigation Finding:	Lighting Upgrade	Date Identified:	2/14/2012
Description of Finding:	Upgrade 32W T8 lamps to 28 W lamps.		
Equipment or System(s):	Interior Lighting	Finding Category:	Retrofits
Finding Type:	Retrofit - Efficient Lighting		

Implementer:	HCC	Benefits:	reduce lighting power
Baseline Documentation Method:	Lighting counts and building occupied hours.		
Measure:	Replace 32W T8 lamps with 28 W lamps		
Recommendation for Implementation:	Replace lighting either all at once or piecemeal. If replaced as lamps burn out, the actual cost is zero but the savings will be realized slowly. Owner's choice for implementation. Suggest trying in limited area before purchasing large quantities. The ballast we were shown is listed for these lamps but that ballast is not the same for all fixtures. i.e. Ballasts are not necessarily consistent.		
Evidence of Implementation Method:	Verify installations by taking pictures of installed bulbs and uninstalled bulbs.		

Annual Electric Savings (kWh):	1,942	Peak Demand Savings (kWh):	1
Estimated Annual kWh Savings ($):	$148	Estimated Annual Demand Savings ($):	$105
Contractor Cost ($):	$1,680		
PBEEEP Provider Cost for Implementation Assistance ($):	$0		
Total Estimated Implementation Cost ($):	$1,680		

Estimated Annual Total Savings ($):	$253	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	6.64	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	6.64	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	2	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	1.2%	Percent of Implementation Costs:	16.2%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Summary

Building: Campus Center (Bldg G)

Site: NHED Hibbing

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
1	UNIT RUN TIMES	$100	$4,649	0.02	$0	0.02	43
	Total for Findings with Payback 3 years or less:	**$100**	**$4,649**	**0.02**	**$0**	**0.02**	**43**
	Total for all Findings:	**$100**	**$4,649**	**0.02**	**$0**	**0.02**	**43**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Campus Center (Bldg G)

FWB Number:	15603	Eco Number:	1
Site:	NHED Hibbing	Date/Time Created:	5/10/2012

Investigation Finding:	UNIT RUN TIMES	Date Identified:	2/14/2012
Description of Finding:	UNITS RUN LONGER THAN REQUIRED FOR NORMAL BUILDING OCCUPANCY.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Time of Day enabling is excessive		

Implementer:	CONTROLS CONTRACTOR	Benefits:	REDUCE OVERALL FAN POWER AND VENTILATION LOADS
Baseline Documentation Method:	Trending of the units show longer run times than actual building occupancy.		
Measure:	CORRECT BUILDING SCHEDULES TO SOMETHING REASONABLE. PROPOSE 10-5 SAT/SUN AND 6 AM -10PM MON-FRIDAY. THERE IS NO REASON TO RUN THE UNIT OCCUPIED FOR ONE INDIVDUAL IN THE BUILDING IF THIS IS THE CASE. THE UNIT CAN CYCLE TO MAINTAIN SPACE TEMPS.		
Recommendation for Implementation:	CORRECT THE SCHEDULE TO SOMETHING REASONABLE. Mon-Fri 6am-10pm, Sat-Sun 10am-5pm.THE UNIT CAN CYCLE TO MAINTAIN SPACE TEMPS.		
Evidence of Implementation Method:	VERIFY SCHEDULES AND TREND Supply Fan status. Provide work orders and paid invoices that document the change ahs been made. Spot check bi-monthly to ensure the changes remain in place.		

Annual Electric Savings (kWh):	31,229	Annual District Energy-Steam Savings (kBtu):	185,026
Estimated Annual kWh Savings ($):	$2,373	Est Annual District Energy-Steam Savings ($):	$2,276
Contractor Cost ($):	$100		
PBEEEP Provider Cost for Implementation Assistance ($):	$0		
Total Estimated Implementation Cost ($):	$100		

Estimated Annual Total Savings ($):	$4,649	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.02	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.02	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	43	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	21.7%	Percent of Implementation Costs:	1.0%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Summary

Building: Hibbing Administration (Bldg M)

Site: NHED Hibbing

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
1	Unit Run Time	$200	$1,741	0.11	$0	0.11	14
3	AHU-1 Simultaneous Heating and Cooling	$1,000	$724	1.38	$0	1.38	5
2	Lighting	$1,060	$349	3.03	$0	3.03	3
	Total for Findings with Payback 3 years or less:	**$1,200**	**$2,465**	**0.49**	**$0**	**0.49**	**19**
	Total for all Findings:	**$2,260**	**$2,814**	**0.80**	**$0**	**0.80**	**22**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Hibbing Administration (Bldg M)

FWB Number:	15604	Eco Number:	1
Site:	NHED Hibbing	Date/Time Created:	5/10/2012

Investigation Finding:	Unit Run Time	Date Identified:	12/10/2011
Description of Finding:	Unit runs longer than it should. Actually, the trends wont show this because we identified it when Egan was on site and he fixed it as part of his maintenance contract. Will put in as zero cost.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Time of Day enabling is excessive		

Implementer:	Controls Contractor	Benefits:	recuced fan run time and ventilation air conditioning
Baseline Documentation Method:	We found it on the BAS and Egan corrected it on the spot.		
Measure:	Correct 24 hour operation to a more reasonable schedule		
Recommendation for Implementation:	None. This is already completed.		
Evidence of Implementation Method:	Trends show unit does not run 24/7 anymore. Trend indicate this to be true.		

Annual Electric Savings (kWh):	5,568	Annual District Energy-Steam Savings (kBtu):	107,133
Estimated Annual kWh Savings ($):	$423	Est Annual District Energy-Steam Savings ($):	$1,318
Contractor Cost ($):	$100		
PBEEEP Provider Cost for Implementation Assistance ($):	$100		
Total Estimated Implementation Cost ($):	$200		

Estimated Annual Total Savings ($):	$1,741	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.11	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.11	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	14	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	8.1%	Percent of Implementation Costs:	1.9%

Findings Details

Building: Hibbing Administration (Bldg M)

FWB Number:	15604	Eco Number:	2
Site:	NHED Hibbing	Date/Time Created:	5/10/2012

Investigation Finding:	Lighting	Date Identified:	2/14/2012
Description of Finding:	T8 Lamps ar all 32 W. Can reduce lamp wattage to 28W.		
Equipment or System(s):	Interior Lighting	Finding Category:	Retrofits
Finding Type:	Retrofit - Efficient Lighting		

Implementer:	HCC	Benefits:	reduced lighting power
Baseline Documentation Method:	Verify installations. Provide reciepts and pictures to document the changes.		
Measure:	replace 32W T8 lamps with 28W T8 lamps		
Recommendation for Implementation:	Replace piece meal for zero up front costs. Replace immediately to qualify for financing through the PBEEEP program.		
Evidence of Implementation Method:	Verify installation. Provide work orders, reciepts, pictures, etc. for proof of work completion.		

Annual Electric Savings (kWh):	3,356	Peak Demand Savings (kWh):	1
Estimated Annual kWh Savings ($):	$255	Estimated Annual Demand Savings ($):	$94
Contractor Cost ($):	$960		
PBEEEP Provider Cost for Implementation Assistance ($):	$100		
Total Estimated Implementation Cost ($):	$1,060		

Estimated Annual Total Savings ($):	$349	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	3.03	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	3.03	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	3	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	1.6%	Percent of Implementation Costs:	10.2%

Findings Details

Building: Hibbing Administration (Bldg M)

FWB Number:	15604	Eco Number:	3
Site:	NHED Hibbing	Date/Time Created:	5/10/2012

Investigation Finding:	AHU-1 Simultaneous Heating and Cooling	Date Identified:	4/12/2012
Description of Finding:	The unit as separate MAT and DAT setpoints, making the unit economize and heat at the same time.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Controls Problems
Finding Type:	Simultaneous Heating and Cooling is present and excessive		

Implementer:	Controls Contractor	Benefits:	Reduced energy use
Baseline Documentation Method:	Trends of OA Damper and Heating valve over a range of temperatures.		
Measure:	Remove the MAT setpoint and modulate Cooling Vlave, Heating Valve, and Economizer in sequence to achieve the desired DAT.		
Recommendation for Implementation:	Reprogram the unit to control OA Damper, Cooling Valve, and Heating Valve is sequence to the DAT setpoint. The MAT setpoint should be removed. The unit shall not be allowed to do simultaneous heating and cooling. The heating avlave should be locked out while economizing and/or mechanically cooling.		
Evidence of Implementation Method:	Trend DAT, DAT stpt, MAT, OAT, OA Damper, RAT and erify the valves and damper modulates to meet DAT setpoint. The heating valve can not be open while the unit is economizing or mechanically cooling.		

Annual District Energy-Steam Savings (kBtu):	58,834	Contractor Cost ($):	$500
Est Annual District Energy-Steam Savings ($):	$724	PBEEEP Provider Cost for Implementation Assistance ($):	$500
		Total Estimated Implementation Cost ($):	$1,000

Estimated Annual Total Savings ($):	$724	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	1.38	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	1.38	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	5	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	3.4%	Percent of Implementation Costs:	9.7%

Findings Summary

Building: Phy Ed/Small Gym (Bldg PE)

Site: NHED Hibbing

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
1	Lighting Upgrade	$420	$154	2.73	$0	2.73	1
	Total for Findings with Payback 3 years or less:	**$420**	**$154**	**2.73**	**$0**	**2.73**	**1**
	Total for all Findings:	**$420**	**$154**	**2.73**	**$0**	**2.73**	**1**

Findings Details

Building: Phy Ed/Small Gym (Bldg PE)

FWB Number:	15605	Eco Number:	1
Site:	NHED Hibbing	Date/Time Created:	5/10/2012

Investigation Finding:	Lighting Upgrade	Date Identified:	2/14/2012
Description of Finding:	All T8 Lamps are 32W can be reduced to 28W lamps		
Equipment or System(s):	Interior Lighting	Finding Category:	Retrofits
Finding Type:	Retrofit - Efficient Lighting		

Implementer:	HCC	Benefits:	Reduced lighting power
Baseline Documentation Method:	Lighting Counts and building occupied schedules. Physical inspection of the lights.		
Measure:	Replace 32W T8 lamps with 28 W lamps		
Recommendation for Implementation:	Replace the 32W T8 with 28W T8 lamps at once in the gym area and the rest can be done piece meal to reduce the overall cost to implement.		
Evidence of Implementation Method:	Verify installation through spot checks at walk through. Provide reciepts for new lamps and work orders showing work was completed or paid invoices for work by outside contractors.		

Annual Electric Savings (kWh):	1,485	Contractor Cost ($):	$420
Estimated Annual kWh Savings ($):	$113	PBEEEP Provider Cost for Implementation Assistance ($):	$0
		Total Estimated Implementation Cost ($):	$420

Estimated Annual Total Savings ($):	$154	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	2.73	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	2.73	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	1	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	0.7%	Percent of Implementation Costs:	4.1%

Findings Summary

Building: Maintenance Bldg (Bldg 1)

Site: NHED Hibbing

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
1	Lighting Upgrade	$630	$226	2.79	$0	2.79	2
	Total for Findings with Payback 3 years or less:	**$630**	**$226**	**2.79**	**$0**	**2.79**	**2**
	Total for all Findings:	**$630**	**$226**	**2.79**	**$0**	**2.79**	**2**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Maintenance Bldg (Bldg 1)

FWB Number:	15606	Eco Number:	1
Site:	NHED Hibbing	Date/Time Created:	5/10/2012

Investigation Finding:	Lighting Upgrade	Date Identified:	2/14/2012
Description of Finding:	T8 fixtures are 32 W lamps. Can upgrade to 28W lamps and reduce overall power lighting power.		
Equipment or System(s):	Interior Lighting	Finding Category:	Retrofits
Finding Type:	Retrofit - Efficient Lighting		

Implementer:	HCC	Benefits:	reduced power at fixtures
Baseline Documentation Method:	Lighting counts and physical inspection of the lamps.		
Measure:	Replace 32W T8 Lamps with 28 W lamps		
Recommendation for Implementation:	Replace all 32W T8s with 28 W lamps. This should be done at once to take advantage of the PBEEEP rebates.		
Evidence of Implementation Method:	Verify installation. Provide completed work orders or paid reciepts from contractors. Provide reciepts for the lamps and walk the site to spot check installations.		

Annual Electric Savings (kWh):	2,226	Contractor Cost ($):	$630
Estimated Annual kWh Savings ($):	$169	PBEEEP Provider Cost for Implementation Assistance ($):	$0
		Total Estimated Implementation Cost ($):	$630

Estimated Annual Total Savings ($):	$226	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	2.79	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	2.79	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	2	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	1.1%	Percent of Implementation Costs:	6.1%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Investigation Checklist

PBEEEP State Government

Rev. 2.0 (12/16/2010)

15601 - Hibbing-ABC Building

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive	YES	AHU-4 AND 5		
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	YES	SOME EXHAUST FANS		
	a.3 (3)	Lighting is on more hours than necessary.	NO		Not Relevant	
	a.4 (4)	OTHER_Equipment Scheduling/Enabling	NO		Not Relevant	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)	NO		Not Relevant	
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.	NO		Investigation looked for, but did not find this issue.	
	b.3 (7)	OTHER_Economizer/OA Loads	NO		Not Relevant	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive	NO		Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	NO		Investigation looked for, but did not find this issue.	
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints	NO		Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls	YES			THE MAIN AHU'S WITH RETURN FANS SEE THE RETURN FANS COME ON RANDOMLY OVER THE WEEKS TRENDS. WE SEE THE RA CFM GREATER THAN THE SUPPLY AIRFLOW WHEN THE SUPPLY FAN IS OFF AND THE OA DAMPER IS CLOSED. THE AIR COULD BE BLOWING OUT THE RELIEF DAMPER, WE JUST DONT KNOW. THE OCCURANCE WAS TOO RANDOM AND WE DO NOT FEEL THAT WE CAN BACK UP THE HOURS THAT WE SEE TO A HIGH DEGREE. TREAT THIS AS A MAINTENANCE ISSUE AND HAVE THE CONTROLS CONTRACTOR TIE THE RETURN FAN OPERATION TO THE SUPPLY FAN OPERATION. I.E. THE RA FAN CANNOT RUN UNLESS THE SF IS RUNNING.
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.	NO		Investigation looked for, but did not find this issue.	
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.	NO		Investigation looked for, but did not find this issue.	THE SET POINTS IN THE BUILDING ARE PRETTY GOOD FOR THE MOST PART. THERE ARE SOME ROOMS THAT ARE SET TO 65, 68 FOR HEATING. THESE ROOMS DO NOT EVER COOL TO THIS POINT AND COULD HAVE SOME EFFECT ON THE MAT'S AT THE UNIT. SCHOOL WAS OUT DURING TESTING AND NO LOAD IN THE SPACES.
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	NO		Investigation looked for, but did not find this issue.	FANS CHANGE SPEEDS FOR HEATING TO THE MINIMUM AS DESIGNED.
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently	NO		Investigation looked for, but did not find this issue.	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary	NO		Investigation looked for, but did not find this issue.	
	d.6 (17)	Other_Controls (Setpoint Changes)	YES		Not cost-effective to investigate	VAV'S 9, 13, 36, 37, 82, 96, 104, AND 123 HAVE SET POINTS OVER 600 DEGREES. VAV 126 HAS A ROOM TEMP OF 215 DEGREES. THE SET POINTS DON'T SEEM TO HAVE AN EFFECT ON THE ROOM TEMPS BUT THEY ARE JUST BLANTANTLY INCORRECT.
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal	NO		Investigation looked for, but did not find this issue.	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal	NO		Investigation looked for, but did not find this issue.	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	NO		Investigation looked for, but did not find this issue.	
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	

PBEEEP State Government

Rev. 2.0 (12/16/2010)

15601 - Hibbing-ABC Building

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
	e.6 (22)	Other_Controls (Reset Schedules)	NO		Investigation looked for, but did not find this issue.	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit	NO		Not Relevant	
	f.2 (24)	Pump Discharge Throttled	NO		Not Relevant	
	f.3 (25)	Over-Pumping	NO		Not Relevant	
	f.4 (26)	Equipment is oversized for load.	NO		Not cost-effective to investigate	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction	NO		Not cost-effective to investigate	
g. Variable Frequency Drives (VFD):	g.1 (28)	VFD Retrofit - Fans	NO		Not Relevant	
	g.2 (29)	VFD Retrofit - Pumps	NO		Not Relevant	
	g.3 (30)	VFD Retrofit - Motors (process)	NO		Not Relevant	
	g.4 (31)	OTHER_VFD	NO		Not Relevant	
h. Retrofits:	h.1 (32)	Retrofit - Motors	NO		Not cost-effective to investigate	REPLACE WITH PREMIUM EFFICIENCY AS THEY FAIL IN THE FUTURE
	h.2 (33)	Retrofit - Chillers	NO		Not cost-effective to investigate	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)	NO		Not Relevant	
	h.4 (35)	Retrofit - Boilers	NO		Not Relevant	
	h.5 (36)	Retrofit - Packaged Gas fired heating	NO		Not Relevant	
	h.6 (37)	Retrofit - Heat Pumps	NO		Not cost-effective to investigate	
	h.7 (38)	Retrofit - Equipment (custom)	NO		Not Relevant	
	h.8 (39)	Retrofit - Pumping distribution method	NO		Not cost-effective to investigate	
	h.9 (40)	Retrofit - Energy/Heat Recovery	NO		Investigation looked for, but did not find this issue.	
	h.10 (41)	Retrofit - System (custom)	NO		Not Relevant	
	h.11 (42)	Retrofit - Efficient Lighting	YES			
	h.12 (43)	Retrofit - Building Envelope	NO		Not cost-effective to investigate	
	h.13 (44)	Retrofit - Alternative Energy	NO		Not cost-effective to investigate	
	h.14 (45)	OTHER_Retrofit	NO		Not Relevant	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard	NO		Not cost-effective to investigate	COIL CLEANING IS AN ISSUE WITH THE OLDER EQUIPMENT BUT THERE IS NO ACCESS TO THE COILS IN THE OLDER UNITS.
	i.2 (47)	Impurity/Contamination	NO		Not Relevant	
	i.3 ( )	Leaky/Stuck Damper	NO		Investigation looked for, but did not find this issue.	
	i.4 ( )	Leaky/Stuck Valve	NO		Not Relevant	THE VALVES GO 100% OPEN IN UNOCCUPIED. THIS IS THEIR SAFETY. THEY COULD PROGRAM TO CONTROL MAT TO 50 DEGREES BUT DIFFICULT TO ESTIMATE SAVINGS TO DO THIS MEASURE. WOULD SAVE MONEY BUT HARD TO DETERMINE HOW MUCH.

PBEEEP State Government

Rev. 2.0 (12/16/2010)

15601 - Hibbing-ABC Building

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
	i.5 (48)	OTHER_Maintenance	NO		Not Relevant	
j. OTHER	j.1 (49)	OTHER	NO		Not Relevant	

Investigation Checklist

PBEEEP State Government

Rev. 2.0 (12/16/2010)

15602 - Hibbing-Fine Arts Bldg F

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive	Yes	AHUS		
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	Yes	AHUS		
	a.3 (3)	Lighting is on more hours than necessary.	No		Investigation looked for, but did not find this issue.	
	a.4 (4)	OTHER_Equipment Scheduling/Enabling	NO		Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)	NO		Not Relevant	
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.	NO		Not Relevant	
	b.3 (7)	OTHER_Economizer/OA Loads	NO		Not Relevant	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive	NO		Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	NO		Investigation looked for, but did not find this issue.	
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints	NO		Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls	NO		Not Relevant	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.	NO		Not Relevant	
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.	NO		Investigation looked for, but did not find this issue.	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	NO		Not Relevant	
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently	NO		Not Relevant	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary	NO		Not Relevant	
	d.6 (17)	Other_Controls (Setpoint Changes)	NO		Investigation looked for, but did not find this issue.	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.6 (22)	Other_Controls (Reset Schedules)	NO		Not Relevant	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit	NO		Not Relevant	
	f.2 (24)	Pump Discharge Throttled	NO		Not Relevant	
	f.3 (25)	Over-Pumping	NO		Not cost-effective to investigate	
	f.4 (26)	Equipment is oversized for load.	NO		Not cost-effective to investigate	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction	NO		Not Relevant	
	g.1 (28)	VFD Retrofit - Fans	NO		Not cost-effective to investigate	

PBEEEP State Government

Rev. 2.0 (12/16/2010)

15602 - Hibbing-Fine Arts Bldg F

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.2 (29)	VFD Retrofit - Pumps	NO		Not cost-effective to investigate	
	g.3 (30)	VFD Retrofit - Motors (process)	NO		Not cost-effective to investigate	
	g.4 (31)	OTHER_VFD	NO		Not cost-effective to investigate	
h. Retrofits:	h.1 (32)	Retrofit - Motors	NO		Not cost-effective to investigate	REPLACE WITH PREMIUM EFFICIENCY AS THEY BURN OUT. PAYBACK IS MUCH QUICKER WHEN DONE IN THIS MANNER.
	h.2 (33)	Retrofit - Chillers	NO		Not Relevant	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)	NO		Not Relevant	
	h.4 (35)	Retrofit - Boilers	NO		Not Relevant	
	h.5 (36)	Retrofit - Packaged Gas fired heating	NO		Not Relevant	
	h.6 (37)	Retrofit - Heat Pumps	NO		Not Relevant	
	h.7 (38)	Retrofit - Equipment (custom)	NO		Not Relevant	
	h.8 (39)	Retrofit - Pumping distribution method	NO		Not cost-effective to investigate	
	h.9 (40)	Retrofit - Energy/Heat Recovery	NO		Not cost-effective to investigate	
	h.10 (41)	Retrofit - System (custom)	NO		Not cost-effective to investigate	
	h.11 (42)	Retrofit - Efficient Lighting	YES			
	h.12 (43)	Retrofit - Building Envelope	NO		Not cost-effective to investigate	
	h.13 (44)	Retrofit - Alternative Energy	NO		Not Relevant	
	h.14 (45)	OTHER_Retrofit	NO		Not Relevant	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard	NO		Not Relevant	
	i.2 (47)	Impurity/Contamination	NO		Not Relevant	
	i.3 ( )	Leaky/Stuck Damper	YES		Not cost-effective to investigate	SEE BELOW
	i.4 ( )	Leaky/Stuck Valve	NO			
	i.5 (48)	OTHER_Maintenance	YES			NOT CALCUATED BECAUSE OF THE NEGATIVE ENERGY SAVINGS FOR HEATING AND HEATING DOMINATES IN THIS CLIMATE. THE OA DAMPER TRIES TO OPEN AS INDICATED BY THE TRENDS BUT THE MAT DOES NOT CHANGE. THE SHAFT IS LIKELY SLIPPING. THE OA DAMPER IS CLOSED AND DOES NOT OPEN. TREND DATA BACKS THIS UP. THIS IS A NOTE FOR THE OWNER IF THEY CHOOSE TO CORRECT IT.
j. OTHER	j.1 (49)	OTHER	YES			ABANDONED THE THEATRE PROGRAM. IF THE THEATRE BECOMES USED ON A FREQUENT BASIS WITH VARIABLE OCCUPANCY, THEN IT SHOULD BE CONSIDERED FOR CO2 CONTROL OF THE VENITLATION AIR. IT DOES NOT MAKE SENSE AT THIS TIME.

Investigation Checklist

PBEEEP State Government

Rev. 2.0 (12/16/2010)

15603 - Hibbing-Campus Center Bldg G

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive	Yes	AHU-1, 2,3		
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	Yes	AHU-1, 2,3		
	a.3 (3)	Lighting is on more hours than necessary.	No		Not Relevant	
	a.4 (4)	OTHER_Equipment Scheduling/Enabling	NO		Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)	NO		Not Relevant	
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.	NO		Investigation looked for, but did not find this issue.	
	b.3 (7)	OTHER_Economizer/OA Loads	NO		Not Relevant	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive	NO		Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	NO		Investigation looked for, but did not find this issue.	
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints	NO		Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls	NO		Not Relevant	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.	NO		Not Relevant	
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.	NO		Not Relevant	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	NO		Not Relevant	
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently	NO		Not Relevant	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary	NO		Not Relevant	
	d.6 (17)	Other_Controls (Setpoint Changes)	NO		Not Relevant	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.6 (22)	Other_Controls (Reset Schedules)	NO		Not Relevant	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit	YES			
	f.2 (24)	Pump Discharge Throttled	NO		Not Relevant	
	f.3 (25)	Over-Pumping	NO		Not cost-effective to investigate	
	f.4 (26)	Equipment is oversized for load.	NO		Not cost-effective to investigate	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction	NO		Not Relevant	
	g.1 (28)	VFD Retrofit - Fans	NO		Not cost-effective to investigate	

PBEEEP State Government

Rev. 2.0 (12/16/2010)

15603 - Hibbing-Campus Center Bldg G

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.2 (29)	VFD Retrofit - Pumps	NO		Not cost-effective to investigate	
	g.3 (30)	VFD Retrofit - Motors (process)	NO		Not cost-effective to investigate	
	g.4 (31)	OTHER_VFD	NO		Not cost-effective to investigate	
h. Retrofits:	h.1 (32)	Retrofit - Motors	NO		Not cost-effective to investigate	REPLACE WITH PREMIUM EFF AS THEY FAIL
	h.2 (33)	Retrofit - Chillers	NO		Not Relevant	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)	NO		Not Relevant	
	h.4 (35)	Retrofit - Boilers	NO		Not Relevant	
	h.5 (36)	Retrofit - Packaged Gas fired heating	NO		Not Relevant	
	h.6 (37)	Retrofit - Heat Pumps	NO		Not Relevant	
	h.7 (38)	Retrofit - Equipment (custom)	NO		Not cost-effective to investigate	
	h.8 (39)	Retrofit - Pumping distribution method	NO		Not cost-effective to investigate	
	h.9 (40)	Retrofit - Energy/Heat Recovery	NO		Not Relevant	
	h.10 (41)	Retrofit - System (custom)	NO		Not Relevant	
	h.11 (42)	Retrofit - Efficient Lighting	NO		Not cost-effective to investigate	
	h.12 (43)	Retrofit - Building Envelope	NO		Not cost-effective to investigate	
	h.13 (44)	Retrofit - Alternative Energy	NO		Not cost-effective to investigate	
	h.14 (45)	OTHER_Retrofit	NO		Not Relevant	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard	NO		Not Relevant	
	i.2 (47)	Impurity/Contamination	NO		Not cost-effective to investigate	
	i.3 ( )	Leaky/Stuck Damper	NO		Investigation looked for, but did not find this issue.	
	i.4 ( )	Leaky/Stuck Valve	NO		Not Relevant	
	i.5 (48)	OTHER_Maintenance	YES			FILTER WAS JAMMED IN THE DAMPER. PRESUMED THAT IT FELL IN AND WAS LEFT. KFI REMOVED THE FILTER. NO SAVINGS, IT WAS JUST RAMMED IN THE RETURN AIR DAMPER; NOT HOLDING IT OPEN OR CLOSED.
j. OTHER	j.1 (49)	OTHER	NO			

Investigation Checklist

PBEEEP State Government

Rev. 2.0 (12/16/2010)

15604 - Hibbing-Administration Bldg M

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive	Yes	AHU		
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	Yes	AHU		
	a.3 (3)	Lighting is on more hours than necessary.	NO		Not Relevant	
	a.4 (4)	OTHER_Equipment Scheduling/Enabling	NO		Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)	NO		Not Relevant	
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.	NO		Investigation looked for, but did not find this issue.	
	b.3 (7)	OTHER_Economizer/OA Loads	NO		Investigation looked for, but did not find this issue.	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive	NO		Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	NO		Investigation looked for, but did not find this issue.	
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints	NO		Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls	NO		Not Relevant	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.	NO		Not Relevant	
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.	NO		Investigation looked for, but did not find this issue.	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	NO		Not Relevant	
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently	NO		Not Relevant	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary	NO		Not Relevant	
	d.6 (17)	Other_Controls (Setpoint Changes)	NO		Not Relevant	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.6 (22)	Other_Controls (Reset Schedules)	NO		Not Relevant	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit	NO		Not Relevant	
	f.2 (24)	Pump Discharge Throttled	NO		Not Relevant	
	f.3 (25)	Over-Pumping	NO		Not cost-effective to investigate	
	f.4 (26)	Equipment is oversized for load.	NO		Not cost-effective to investigate	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction	NO		Not Relevant	
	g.1 (28)	VFD Retrofit - Fans	NO		Not Relevant	

PBEEEP State Government

Rev. 2.0 (12/16/2010)

15604 - Hibbing-Administration Bldg M

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.2 (29)	VFD Retrofit - Pumps	NO		Not Relevant	
	g.3 (30)	VFD Retrofit - Motors (process)	NO		Not Relevant	
	g.4 (31)	OTHER_VFD	NO		Not Relevant	
h. Retrofits:	h.1 (32)	Retrofit - Motors	NO		Not Relevant	
	h.2 (33)	Retrofit - Chillers	NO		Not Relevant	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)	NO		Not Relevant	
	h.4 (35)	Retrofit - Boilers	NO		Not Relevant	
	h.5 (36)	Retrofit - Packaged Gas fired heating	NO		Not Relevant	
	h.6 (37)	Retrofit - Heat Pumps	NO		Not Relevant	
	h.7 (38)	Retrofit - Equipment (custom)	NO		Not Relevant	
	h.8 (39)	Retrofit - Pumping distribution method	NO		Not Relevant	
	h.9 (40)	Retrofit - Energy/Heat Recovery	NO		Investigation looked for, but did not find this issue.	
	h.10 (41)	Retrofit - System (custom)	NO		Not Relevant	
	h.11 (42)	Retrofit - Efficient Lighting	YES	T8'S		
	h.12 (43)	Retrofit - Building Envelope	NO		Not cost-effective to investigate	
	h.13 (44)	Retrofit - Alternative Energy	NO		Not cost-effective to investigate	
	h.14 (45)	OTHER_Retrofit	NO		Not Relevant	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard	NO		Investigation looked for, but did not find this issue.	
	i.2 (47)	Impurity/Contamination	NO		Not Relevant	
	i.3 ( )	Leaky/Stuck Damper	NO		Not Relevant	
	i.4 ( )	Leaky/Stuck Valve	NO		Investigation looked for, but did not find this issue.	
	i.5 (48)	OTHER_Maintenance	NO		Not Relevant	
j. OTHER	j.1 (49)	OTHER	NO		Not Relevant	

Investigation Checklist

PBEEEP State Government

Rev. 2.0 (12/16/2010)

15605 - Hibbing- Bldg PE

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive	NO		Investigation looked for, but did not find this issue.	In reality, the building runs pretty well. We found no evidence of over temperatures, schedules, etc. The only issue appears to be the ventilation is not being provided to the units at a noticeable percentage based on mixed air temps. Correcting this is not an heating energy savings but probably should be looked at more closely.
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	NO		Investigation looked for, but did not find this issue.	
	a.3 (3)	Lighting is on more hours than necessary.	NO		Not Relevant	
	a.4 (4)	OTHER_Equipment Scheduling/Enabling	NO		Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)	NO		Not Relevant	
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.	NO		Not Relevant	
	b.3 (7)	OTHER_Economizer/OA Loads	NO		Not Relevant	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive	NO		Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	NO		Investigation looked for, but did not find this issue.	
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints	NO		Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls	NO		Not Relevant	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.	NO		Not Relevant	
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.	NO		Investigation looked for, but did not find this issue.	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	NO		Not Relevant	
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently	NO		Not Relevant	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary	NO		Not Relevant	
	d.6 (17)	Other_Controls (Setpoint Changes)	NO		Not Relevant	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal	NO		Investigation looked for, but did not find this issue.	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.6 (22)	Other_Controls (Reset Schedules)	NO		Not Relevant	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit	NO		Not Relevant	
	f.2 (24)	Pump Discharge Throttled	NO		Not Relevant	
	f.3 (25)	Over-Pumping	NO		Not Relevant	

PBEEEP State Government

Rev. 2.0 (12/16/2010)

15605 - Hibbing- Bldg PE

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
	f.4 (26)	Equipment is oversized for load.	NO		Not cost-effective to investigate	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction	NO		Not cost-effective to investigate	
g. Variable Frequency Drives (VFD):	g.1 (28)	VFD Retrofit - Fans	NO		Not Relevant	
	g.2 (29)	VFD Retrofit - Pumps	NO		Not Relevant	
	g.3 (30)	VFD Retrofit - Motors (process)	NO		Not Relevant	
	g.4 (31)	OTHER_VFD	NO		Not Relevant	
h. Retrofits:	h.1 (32)	Retrofit - Motors	NO		Not cost-effective to investigate	
	h.2 (33)	Retrofit - Chillers	NO		Not Relevant	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)	NO		Not cost-effective to investigate	
	h.4 (35)	Retrofit - Boilers	NO		Not Relevant	
	h.5 (36)	Retrofit - Packaged Gas fired heating	NO		Not Relevant	
	h.6 (37)	Retrofit - Heat Pumps	NO		Not Relevant	
	h.7 (38)	Retrofit - Equipment (custom)	NO		Not cost-effective to investigate	
	h.8 (39)	Retrofit - Pumping distribution method	NO		Not cost-effective to investigate	
	h.9 (40)	Retrofit - Energy/Heat Recovery	NO		Not cost-effective to investigate	
	h.10 (41)	Retrofit - System (custom)	NO		Not Relevant	
	h.11 (42)	Retrofit - Efficient Lighting	YES			
	h.12 (43)	Retrofit - Building Envelope	NO		Not cost-effective to investigate	
	h.13 (44)	Retrofit - Alternative Energy	NO		Not cost-effective to investigate	
	h.14 (45)	OTHER_Retrofit	NO		Not cost-effective to investigate	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard	NO		Investigation looked for, but did not find this issue.	
	i.2 (47)	Impurity/Contamination	NO		Not Relevant	
	i.3 ( )	Leaky/Stuck Damper	NO		Investigation looked for, but did not find this issue.	
	i.4 ( )	Leaky/Stuck Valve	NO			
	i.5 (48)	OTHER_Maintenance	YES			The units appear to be bringing in little ventilation air. The gym unit is running the room that houses it at a massive negative. RA appears to be not returning to the unit in correct volume. Possibly a closed damper. Could not locate the source of the negative. Obviously something is restricting the flow of return air to the unit. This shoudl be found more for building functionality than energy savings.
j. OTHER	j.1 (49)	OTHER	NO		Not Relevant	

Investigation Checklist

PBEEEP State Government

Rev. 2.0 (12/16/2010)

15606 - Hibbing- Maintenance-Bldg U

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive	NO		Investigation looked for, but did not find this issue.	There is not too much to this small building. Nothing as far as significant findings.
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	NO		Investigation looked for, but did not find this issue.	
	a.3 (3)	Lighting is on more hours than necessary.	NO		Not Relevant	
	a.4 (4)	OTHER_Equipment Scheduling/Enabling	NO		Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)	NO		Not Relevant	
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.	NO		Not Relevant	
	b.3 (7)	OTHER_Economizer/OA Loads	NO		Not cost-effective to investigate	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive	NO		Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	NO		Investigation looked for, but did not find this issue.	
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints	NO		Not cost-effective to investigate	
	c.4 (11)	OTHER_Controls	NO		Not Relevant	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.	NO		Not Relevant	
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.	NO		Investigation looked for, but did not find this issue.	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	NO		Not Relevant	
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently	NO		Not Relevant	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary	NO		Not Relevant	
	d.6 (17)	Other_Controls (Setpoint Changes)	NO		Not Relevant	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal	NO		Not cost-effective to investigate	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal	NO		Not Relevant	
	e.6 (22)	Other_Controls (Reset Schedules)	NO		Not Relevant	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit	NO		Not Relevant	
	f.2 (24)	Pump Discharge Throttled	NO		Not Relevant	
	f.3 (25)	Over-Pumping	NO		Not Relevant	
	f.4 (26)	Equipment is oversized for load.	NO		Not cost-effective to investigate	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction	NO		Not Relevant	
	g.1 (28)	VFD Retrofit - Fans	NO		Not Relevant	

PBEEEP State Government

Rev. 2.0 (12/16/2010)

15606 - Hibbing- Maintenance-Bldg U

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.2 (29)	VFD Retrofit - Pumps	NO		Not Relevant	
	g.3 (30)	VFD Retrofit - Motors (process)	NO		Not Relevant	
	g.4 (31)	OTHER_VFD	NO		Not cost-effective to investigate	
h. Retrofits:	h.1 (32)	Retrofit - Motors	NO		Not Relevant	
	h.2 (33)	Retrofit - Chillers	NO			
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)	NO		Not Relevant	
	h.4 (35)	Retrofit - Boilers	NO		Not Relevant	
	h.5 (36)	Retrofit - Packaged Gas fired heating	NO		Not Relevant	
	h.6 (37)	Retrofit - Heat Pumps	NO		Not Relevant	
	h.7 (38)	Retrofit - Equipment (custom)	NO		Not cost-effective to investigate	
	h.8 (39)	Retrofit - Pumping distribution method	NO		Not cost-effective to investigate	
	h.9 (40)	Retrofit - Energy/Heat Recovery	NO		Not cost-effective to investigate	
	h.10 (41)	Retrofit - System (custom)	NO		Not cost-effective to investigate	
	h.11 (42)	Retrofit - Efficient Lighting	YES			
	h.12 (43)	Retrofit - Building Envelope	NO		Not cost-effective to investigate	
	h.13 (44)	Retrofit - Alternative Energy	NO		Not cost-effective to investigate	
	h.14 (45)	OTHER_Retrofit	NO		Not cost-effective to investigate	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard	NO		Not Relevant	
	i.2 (47)	Impurity/Contamination	NO		Not cost-effective to investigate	
	i.3 ( )	Leaky/Stuck Damper	NO		Not cost-effective to investigate	
	i.4 ( )	Leaky/Stuck Valve	NO		Not Relevant	
	i.5 (48)	OTHER_Maintenance	NO		Not Relevant	
j. OTHER	j.1 (49)	OTHER	NO		Not cost-effective to investigate	

Building Name	Space Usage Type	Corrected Space Type	Space Area	**Change to EUI**
Administration (BLDG M)	Office		12,520	
Athletics/Big Gym/Boiler room (BLDG P	Field House / Gym		17,374	
Athletics/Big Gym/Boiler room (BLDG P	Mechanical		1,930	
Building A,B,C	College Classroom		55,838	
Building A,B,C	College Laboratory	College Classroom	34,899	-27
Building A,B,C	Office		13,960	
Building A,B,C	Computer Center	College Classroom	13,960	-2
Building A,B,C	Data Center	College Classroom	13,960	-19
Building A,B,C	Administration		6,980	
Campus Center (BLDG G)	College Classroom		8,659	
Campus Center (BLDG G)	Office		3,711	
Ceramic Building (BLDG E)	College Laboratory	College Classroom	1,456	-1
Chiller Room (BLDG U)	Mechanical		2,714	
Cold Storage (BLDG 2)	Warehouse - Active		2,880	
College Dorms	Dormitory		32,275	
College Dorms	Dedicated Kitchen / Food Prep		4,994	
Covered Walkways	Mechanical		7,786	
Electrical Room East (BLDG U)	Mechanical		2,280	
Fine Arts (BLDG F)	College Classroom		16,726	
Fine Arts (BLDG F)	Auditorium		5,575	
Fine Arts (BLDG F)	College Laboratory	College Classroom	2,788	-2
Fine Arts (BLDG F)	Office		2,788	
Heating Plant Addition(BLDG U)	Mechanical		1,856	
Library (BLDG L)	Library		7,065	
Library (BLDG L)	College Classroom		3,532	
Library (BLDG L)	Office		3,532	
Maintenance Bldg (BLDG 1)	Maintenance Repair		6,000	
Palucci Planetarium (BLDG P)	College Laboratory	College Classroom	10,321	-8
Palucci Planetarium (BLDG P)	Mechanical		1,214	
Palucci Planetarium (BLDG P)	Office		607	
Phy Ed. Small Gym (BLDG PE)	Field House / Gym		12,701	
Science (BLDG D)	College Classroom		9,742	
Science (BLDG D)	College Laboratory		9,482	
Science (BLDG D)	Office		2,370	
Science (BLDG D)	Data Center	College Classroom	2,110	-3
Stadium	Field House / Gym		1,600	
Storage (Building 5)	Warehouse - Active		6,000	
Storage Building (Building 6)	Parking Garage		5,544	
Storage Building (Building 6)	Warehouse - Inactive		2,856	
Student Shop Storage (BLDG 4)	Warehouse - Active		4,000	
Vehicle Storage (BLDG 3)	Parking Garage		6,000	
				-61

Laboratory standard EUI is 389 and based on large number of continuously operating hoods
Data center standard EUI is 596 and is based on installation of high density servers
Computer center standard EUI is 157 and is based on a high density of large monitors
College classroom EUI of 107 has been substituted for these

PBEEEP
State Government

Public Buildings Enhanced Energy Efficiency Program

SCREENING RESULTS FOR HIBBING COMMUNITY COLLEGE

Admin Minnesota
DEPARTMENT OF ADMINISTRATION

August 26, 2011

Summary Table

Hibbing Community College	
Location	1515 E 25th St Hibbing, MN 55746
Facility Manager	Jimmer Hodge
Number of Buildings	22
Interior Square Footage	362,582
PBEEEP Provider	Center for Energy and Environment (Gustav Brändström)
State's Project Manager	Keith Harvey, Provost NHED
Date Visited	January 23, 2011
Annual Energy Cost (from B3)	$ 546,576 (2010)
Utility Company	Hibbing Public Utilities (Electric, Natural Gas, and Steam)
Site Energy Use Index (from B3)	87.7 kBtu/sq ft(2009)
Benchmark EUI (from B3)	162.75 kBtu/sq ft

Screening Overview

The goal of screening is to select buildings where an in-depth energy investigation can be performed to identify energy savings opportunities that will generate savings with a relatively short (1 to 5 years) and certain payback. The screening of Hibbing Community College was performed by the Center for Energy and Environment (CEE) with the assistance of the facility staff. A walk-through was conducted on January 23, 2011 and interviews with the facility staff were carried out to fully explore the status of the energy consuming equipment and their potential for recommissioning. This report is the result of that information.

The Hibbing Community College campus consists of 22 buildings totaling 362,582 square feet (sq ft) located in Hibbing, MN. Most of the buildings are interconnected and contain college classrooms.

Recommendation for Investigation

Ten buildings on this site with 237,217 square feet are recommended for an energy investigation. Hibbing Community College has large area, large HVAC equipment, and high level of automation. The campus has expensive steam for heatinglow energy use, Scheduling of mechanical equipment, and operation of mechanical equipment

Building Name	State ID	Square Footage	Year Built
Buildings Recommended For Investigation			
Building A,B,C	E26258T1201	139,596	2001
Chiller Room (BLDG U)	E26143C0467	2,714	1967
Athletics/Big Gym/Boiler room (BLDG PE)	E26143C0569	19,304	1969
Electrical Room East (BLDG U)	E26258T0693	2,280	1988
Fine Arts (BLDG F)	E26143C0671	27,876	1971
Heating Plant Addition(BLDG U)	E26258T0799	1,856	1999
Campus Center (BLDG G)	E26143C0774	12,370	1974
Phy Ed. Small Gym (BLDG PE)	E26143C1088	12,701	1988
Administration (BLDG M)	E26143C0167	12,520	1967
Maintenance Bldg (BLDG 1)	E26258T0893	6,000	1983
	Total	237,217	
Buildings Not Recommended for Investigation			
Library (BLDG L)	E26143C0267	14,129	1967
Ceramic Building (BLDG E)	E26143C1304	1,456	2004
Palucci Planetarium (BLDG P)	E26143C0878	12,142	1978
Science (BLDG D)	E26143C0367	23,704	1967
Cold Storage (BLDG 2)	E26258T0594	2,880	1964
College Dorms	E26258T1404	37,269	1992
Covered Walkways	E26143C0987	7,785	1987
Stadium	E26143C1192	1,600	1992
Storage (Building 5)	E2625870500	6,000	1967
Storage Building (Building 6)	E26258T0108	8,400	2008
Student Shop Storage(BLDG 4)	E26258T0993	4,000	1983
Vehicle Storage (BLDG 3)	E26258T1193	6,000	1993
	Total	125,365	

Building Overview Section

Mechanical Equipment

Heating Plant

The heat throughout the campus comes from district steam and gets converted to hot water in the U-building. There is a single boiler that is used for backup only. The hot water is pumped around the campus using three 10hp, 600 GPM pumps, serving all buildings on campus. Each building has its own hot water pump to deliver heat to units in the building.

Cooling Plant

Only about half of the campus is cooled. The ABC buildings are all fully cooled using chilled water, while some rooms in other buildings have supplemental cooling using DX units. The chilled water is produced by a 400 Ton York Variable Speed Centrifugal Chiller with a 40hp cooling tower. The chilled water is pumped to the ABC buildings with a single 60hp, 800 GPM pump. The cooling tower water is pumped by a 40hp, 1,260 GPM pump.

ABC Buildings - Automotive, Electrical, Law Enforcement, Administration, Commons, etc.
The ABC buildings were constructed in 2001 and are the newest buildings on campus. All the HVAC equipment is located in penthouses. The systems are VAV AHUs and CV MAUs.

D Building - Math, Science, etc.
The math and science building is getting new HVAC and is therefore excluded from this study.

E Building - Ceramics
The ceramics building has very small hot water air handler. The unit has a coil pump for hot water delivery.

Planetarium

The Planetarium is used only on special occasions and only conditioned when occupied. This building is excluded from the study because the low hours of use.

Controls and Trending

There are two different BAS at Hibbing CC. The ABC buildings have a Honeywell system while the others have an Inet7 system. Both systems are hosted on desk top computers which are probably ten years old and have inadequate capacity to properly run the software, as a result they lock up frequently. The Honeywell computer does not have a USB port, so floppy disks are the only current alternative. The state plans to upgrade these computers, possibly prior to the start of the study.
The iNet7 system is a great trending system and should not have any problems trending any desirable point. The Honeywell system should also be capable of trending.

Lighting

Indoor lighting- Interior lighting primarily consists of T8 32W lights, but some T12 lighting remains. Most classroom lights are operated by a manual switches.

Outdoor lighting- The outdoor lighting consists of parking lot lighting, side walk lights and some decorative lighting. Some of the lighting is on the BAS and is operated using schedules and daylight sensors.

Energy Use Index B3 Benchmark

The site Energy Use Index (EUI) for the building is 87.7 kBtu/sq ft, which is 46% lower than the B3 Benchmark of 163 kBtu/sq ft. The benchmark value is inflated by incorrect space use specified in B3. The actual benchmark value, based on CEE's analysis, should be closer to 93 kBtu/sq ft. The site EUIs for State of Minnesota buildings are 23% lower than their corresponding B3 Benchmarks on average. This shows the Hibbing Community College has room for improvement.

Metering

The campus has four electrical meters, one steam meter for district steam, and five natural gas meters. The dormitories are the only buildings that are metered completely separately. The ABC buildings have their own gas meter, but share the main campus electrical meter. The backup boilers have their own gas meter, so finding boiler energy use will be straight forward. The rest of the buildings share the main campus electric and natural gas meter.

Documentation

The campus blueprints are all collected in the Maintenance office. They are very old, but mostly complete. The ABC buildings are complete with mechanical and electrical schedules. There have been many upgrades in the last ten years, Science, Planetarium, and Heating Plant Upgrade, specifically, and the plans for those upgrades are complete.

Occupancy

The class schedule is from 8am to 4pm in general, but there are some night classes that end at 10pm. The HVAC runs 6am to 10pm, which are the hours the buildings are unlocked. The majority of the staff is there from 7am to 4pm.

Mechanical Equipment Summary Table	
Quantity	**Equipment Description**
2	Building Automation System (Honeywell EBI and iNet 7)
10	Buildings
237,217	Interior Square Feet
13	Air Handlers
265	VAV Boxes
37	Fan powered VAV boxes
3	FCUs
1	Steam to Water Heat Exchangers
3	Hot Water Pumps
3	Chilled Water Pumps
3	Dry Coolers
4	VUHs
7	Exhaust Fans
800	Approximate number of points for trending
660	Minimum trended points

This screening report is based on the PBEEEP Guidelines. It is based on one site visit, review of the facility documentation, building automation system, a limited inspection of the facility and interviews with the staff. The purpose of the screening report is to evaluate the potential of the facility for the implementation of cost-effective energy efficiency savings through recommissioning. To the best of our knowledge the information here is accurate. It provides a high level view of many of the important parameters of the mechanical equipment in the facility. Because it is the result of a limited audit survey of the facility, it may not be completely accurate or inclusive.

Building Summary Table

The following tables are based on information gathered from interviews with facility staff, a building walk-through, automation system screen-captures, and equipment documentation. The purpose of the tables is to provide the size and quantity of equipment and the level of control present in each building. It is complete and accurate to the best of our knowledge.

Fine Arts – Building F
State ID# E2614C0671

Area (sq ft)	27,876	Year Built	1971	EUI/Benchmark	65/162.75

HVAC Equipment

Air Handlers (7 Total)

Description	Type	Size	Notes
AHU 1			Serves Theatre
AHU 2			
AHU 3			
AHU 4			Serves Music and Art Rooms
AHU 5			
AHU 6			
AHU 7			

Hot Water System

Description	Type	Size	Notes
Pump 1	Heating Main	150 GPM, 5 HP	
Pump 2	Heating Lead	105 GPM, 3HP	
Pump 3	Heating Lag	105 GPM, 3 HP	
Pump 4	Heating S1	18 GPM, ¼ Hp	
Pump 5	Heating S2	11 GPM,1/4 HP	
Pump 6	Heating S3	6 GPM, 1/6 HP	
Pump 7	Heating S4	7 GPM, 1/6 HP	

UH (5 total)

Description	Type	Size	Notes
UH 1	Unit Heater	41.1 kBtu/h,	Rm 101
UH 2	Unit Heater	14.6 kBtu/h, 0.5 gpm	Rm 118
UH 3	Unit Heater	92.4 kBtu/h, 8.74 gpm	Rm 127
UH 4	Unit Heater	33.8 kBtu/h, 1.0 gpm	Rm 207
UH 5	Unit Heater	33.8 kBtu/h, 1.0 gpm	Rm 207

2 Exhaust Fans

Points on BAS

Air Handlers

Description	Points
AHUs	OAT, MAT, DAT and Setpoint, OA & RA Damper Pos., HW VLV, F&B Damper Pos., Coil Pump, MA Reset Setpoint, Classroom Setpoint, SF-S and Amps

Hot Water System

Description	Points
	HWST, HWRT, Rad pump 1 S/S, Rad Pump 2 S/S, Backup Pump S/S, Rad Pump1 Amps, Rad Pump 2 Amps

Exhaust Fans

Description	Points: EF-S (2X)

Building A, B, C State ID# E26258T1201					
Area (sq ft)	139,596	Year Built	2001	EUI/Benchmark	
HVAC Equipment					

Air Handlers (17 Total)

Description	Type	Size	Notes
AHU S1	VAV AHU	SF 15 hp, 9,000cfm RF 3hp, 7,650cfm	Building A. 1st Level Medical
AHU S2	VAV AHU	SF20 hp,11,000cfm RF9315 cfm,5 hp	Building A. Food Service
AHU S3	VAV AHU	SF15hp, 11,500cfm RF3hp, 9500cfm	Building A. Remodel Addition
AHU S4	VAV AHU	SF 30hp, 22,000cfm RF 7.5hp, 18,400 cfm	Building A. 2nd Lvl West
AHU S5	VAV AHU	SF 15hp, 12,000cfm RF 5hp,11,000cfm	Building B. 1st Lvl Mid North
AHU S6	VAV AHU	SF 15hp,12,000cfm RF 3hp,7,520 cfm	Building B. 1st Lvl Mid South
AHU S7	VAV AHU	SF 15hp, 9,000cfm RF 3hp,7,350cfm	Building B. Law Enforcement
AHU S8	VAV AHU	SF 20hp, 12,000cfm RF 5hp, 11,080cfm	Building B. 2nd Lvl Mid South
AHU S9	VAV AHU	SF 5hp, 4,000 cfm RF 1.5hp,4,000 cfm	Building C. Auto Classroom
MA 1	MAU	SF 5hp, 6,000cfm	Building C. Interlocked with EF-4 Diesel underfloor
MA 2	MAU	SF 10hp, 13,000cfm	Building C. Interlocked with EF-5 Diesel Gen Exhaust
MA 3	MAU	SF 3hp, 4,500cfm	Building C. Interlocked with EF-11 Welding
MA 4	MAU	SF 7.5hp, 8,000cfm	Building C. Interlocked with EF-8. Auto Lab ll Gen
MA 5	MAU	SF 3hp, 5,000cfm	Building C. Interlocked with EF-7 Auto Lab l Gen
MA 6	MAU	SF 5hp, 6,000cfm	Building C. Interlocked with EF-9 Auto Labs underfloor
MA 7	MAU	SF 2hp, 3,000cfm	Building C. Interlocked with EF-6 Steam Cleaning
MA 8	MAU	SF 15hp, 20,550cfm	Building A. Interlocked with EF-12, 13 Kitchen

VAV Boxes (138 Total)

Description	Type	Size	Notes
VAV Box 1-126	VAV	Max cfm range: 70-3400	QTY-126
Fan Powered VAV Box		Max cfm range: 280-2500	QTY-12

HVAC Equipment Cont'd

Pumps

Description	Type	Size	Notes
P-1	Heating Water	300gpm,15hp	
P-2	Heating Water	300gpm,15hp	
P-3	Heating Water	300gpm,15hp	
P-4	Chilled Water	400 gpm,25hp	
P-5	Chilled Water	400 gpm,25hp	
P-6	Chilled Water	400 gpm,25hp	
P-7	Domestic Water	10 gpm, 1/3hp	
P-8	Domestic Water	10 gpm, 1/3hp	
P-9	AHU-1	20 gpm, 1/3hp	
P-10	AHU-2	47.5 gpm,1/2 hp	
P-11	AHU-3	22 gpm, 1/3hp	
P-12	AHU-4	46 gpm,1/2hp	
P-13	AHU-5	22 gpm,1/3hp	
P-14	AHU-6	22 gpm,1/3hp	
P-15	AHU-7	22 gpm,1/3hp	
P-16	AHU-8	52 gpm, 1/2hp	
P-17	AHU-9	11 gpm, 1/3 hp	

UH (12 total)

Description	Type	Size	Notes
UH-1	Unit Heater	1400cfm,1/20hp	Mech Penthouse A
UH-2	Unit Heater	1400cfm,1/20hp	Mech Penthouse A
UH-3	Unit Heater	1400cfm,1/20hp	Mech Penthouse B
UH-4	Unit Heater	1400cfm,1/20hp	Mech Penthouse B
UH-5	Unit Heater	1100cfm,1/30hp	Mech Penthouse C
UH-6	Unit Heater	1100cfm,1/30hp	Mech Penthouse C
UH-7	Unit Heater	1100cfm,1/30hp	Recycling Room
UH-8	Unit Heater	790cfm,1/30 hp	Water Meter Room
UH-9	Unit Heater	750cfm,1/30 hp	Maint/Locker/Stor
UH-10	Unit Heater	1100 cfm, 1/30 hp	Firing Range
UH-11	Unit Heater	1100 cfm, 1/30 hp	Heat/Appl Shop
UH-12	Unit Heater	790 cfm, 1/30 hp	Welding Shop

HVAC Equipment Cont'd

Exhaust Fans (28 Total)

Description	Type	Size	Notes
E1	Exhaust fan	2530cfm, 1 hp	Toilet
E2	Exhaust fan	1230 cfm, 0.5hp	Toilet
E3	Exhaust fan	1730cfm, 1hp	Toilet
E4	Exhaust fan	6000cfm, 3hp	Diesel Underfloor
E5	Exhaust fan	13000cfm, 5hp	Diesel Gen Exh
E6	Exhaust fan	3000cfm, 0.5hp	Steam Cleaning
E7	Exhaust fan	5000cfm, 2 hp	Auto Mech Lab 1
E8	Exhaust fan	8000cfm, 3hp	Auto Mech Lab 2
E9	Exhaust fan	6000cfm, 3hp	Auto Labs 1 and 2 Underfloor
E10	Exhaust fan	750 cfm,0.25hp	Fuel Injection Room
E11	Exhaust fan	4500 cfm,3hp	Welding Room Exh
E12	Exhaust fan	3690 cfm,2hp	Chefs Kitchen Range hood
E13	Exhaust fan	2270cfm, 1.5 hp	Café Grille Hood
E14	Exhaust fan	5600cfm, 3 hp	Restaurant Kitchen Range Hood
E15	Exhaust fan	700 cfm,0.25 hp	Chefs Kit Dishwashing Machine
E16	Exhaust fan	6075 cfm,3hp	Bakery Hood
E17	Exhaust fan	2865 cfm, 1.5 hp	Café Fryer Hood
E18	Exhaust fan	900cfm,0.25 hp	Rest Kit Dishwashing Machine
E19	Exhaust fan	750 cfm, 0.5hp	Chemical Fume Hood
E20	Exhaust fan	250cfm, 0.1666hp	Chemical Storage
E21	Exhaust fan	1000cfm, 0.5 hp	Computer Repair Auto Lab 1
E22	Exhaust fan	1300cfm, 0.5 hp	Electronics Lab 1
E23	Exhaust fan	500cfm, 0.25hp	Cad Lab (Printer)
E24	Exhaust fan	2000cfm, 1hp	Heat/ Appliance Repair shop hood
E25	Exhaust fan	250cfm, 1/6hp	Elevator equipment room
E26	Exhaust fan	600cfm, 0.25hp	Crime Lab (Latent Print)
E27	Exhaust fan	600cfm, 0.25hp	Kitchen Oven (heat)
E28	Exhaust fan	1500cfm, 0.5hp	Kitchen Pop Room

Fan Coil Units (1Total)

Description	Type	Size	Notes
FC 1	Fan Coil	2400cfm, 2 hp	

Misc

Description	Type	Size	Notes
AC1-4	Air compressor	10-18.6 hp	

Infrared Heater (4 total)

Description	Type	Size	Notes
Auto Lab 1	Infrared heater	Input 360 kBtu/h	
Auto Lab2	Infrared heater	Input 480 kBtu/h	
Hvy Equip	Infrared heater	Input 480 kBtu/h	
Engine Shop	Infrared heater	Input 720 kBtu/h	

CUH (6 total)

Description	Type	Size	Notes
CUH 1-5	Cabinet	630 cfm, 1/10 hp,41 kBtu/h	

Points on BAS

Air Handlers

Description	Points
1st Flr Medical	Ret Humid, RAT, Damper Control Sig, Relief Damper, OAT, OA Damper, OA, Return CFM, Return Air Damper, Supp CFM, Ret fan, MAT, Sup Fan, SAT, Coil Pump, CWR, HWR, HWS, CWS, Heating Valve, CHW Valve, Supp Duct Static, Actual Return CFM, Bldg Static Press, AHU! Supp, AHU1 Return, AHU1 OA CFM, AHU1 RF CFM Diff, AHU1 Supp Air Reset, AHU1 Supp Hi Limit, AHU1 Duct Static Press, AHU1 Night Setback, AHU1 Night Setup, AHU1 Mix Air Low Limit
AHU2 Food Service	Ret Humid, RAT, Damper Control Sig, Relief Damper, Return CFM, Return fan, OAT, OA Dampers, OA CFM, Ret Air Damper, Supply CFM, Supply fan, SAT, Coil Pump, HWR< HWS< CWR< CWS, Heating valve, CHW Valve, AHU2 OA CFM, AHU2 RF CFM Diff, AHU2 Supp Air Reset, AHU2 Hi Lim it, AHU2 Duct Static Press, AHU2 Night Setback, AHU2 Night Setup, AHU2 Mix Air Low Limit, Supp Duct Static press, AHU2 Supply, AHU2 Return, Actual Return cfm, Bldg Static Press
AHU3-Remodeled Addition	Ret Humid, RAT, Damper Control Sig, Relief Damper, Return CFM, Ret Fan, OAT, OA Damper, Ret Air Damper, MAT, Coil Pump, OA Damper, OA CFM, Supp CFM, Supp Fan, SAT, HWR, HWS, CWR, CHW Valve, Heating Valve, CHW Valve, AHU3 OA CFM, AHU3 RF CFM Diff, AHU3 Supp Air Reset, AHU3 Supp HI Limit, AHU3 Duct Static Press, AHU3 Night Setback, AHU3 Night Setup, AHU3 Mix Air Low Limit,AHU3 Supp, AHU3 Return, Supp Duct Static pres, Actual Return CFM, Bldg Static Press
AHU 4-Second Level West	Ret Humid, RAT, Ret Fan, Damper Control Sig, Relief Damper, Ret CFM, OAT, OA Damper, Ret Air Damper, MAT, Coil Pump, OA CFM, Supp CFM, Supp Fan, SAT, CWS,CWR, CHW Valve, HWR, HWS, Heating Valve, CHW Valve, Ret Air Damper, AHU4 OA CFM, AHU RF-CFM Diff, AHU4 Sup Air Reset, AHU4 Supply Hi Limit, AHU4 Duct Static Press, AHU4 Night Setback, AHU4 Night Setup, AHU4 Mix Air Low Limit, AHU4 Supp, AHU4 Ret, Supply Duct Static Press, Actual Return CFM, Bldg Static Press
AHU5	Ret Humid, RAT, Ret Fan, Damper Control Sig, Relief Damper, Ret CFM, OAT, OA Damper, Ret Air Damper, MAT, Coil Pump, OA CFM, Supp CFM, Supp Fan, SAT, CWS,CWR, CHW Valve, HWR, HWS, Heating Valve, CHW Valve, Ret Air Damper, AHU5 OA CFM, AHU RF-CFM Diff, AHU5 Sup Air Reset, AHU5 Supply Hi Limit, AHU5 Duct Static Press, AHU5 Night Setback, AHU5 Night Setup, AHU5 Mix Air Low Limit, AHU5 Supp, AHU5 Ret, Supply Duct Static Press, Actual Return CFM, Bldg Static Press

Points on BAS

Air Handlers

Description	Points
AHU 6- 1st Lvl-Mid	Ret Humid, RAT, Ret Fan, Damper Control Sig, Relief Damper, Ret CFM, OAT, OA Damper, Ret Air Damper, MAT, Coil Pump, OA CFM, Supp CFM, Supp Fan, SAT, CWS,CWR, CHW VLV, HWR, HWS, Heating VLV, CHW VLV, Ret Air Damper, AHU5 OA CFM, AHU RF-CFM Diff, AHU6 Sup Air Reset, AHU6 Supply Hi Limit, AHU6 Duct Static Press, AHU6 Night Setback, AHU6 Night Setup, AHU6 Mix Air Low Limit, AHU6 Supp, AHU5 Ret, Supply Duct Static Press, Actual Return CFM, Bldg Static Press
AHU 7- Law Enforcement	Ret Humid, RAT, Ret Fan, Damper Control Sig, Relief Damper, Ret CFM, OAT, OA Damper, Ret Air Damper, MAT, Coil Pump, OA CFM, Supp CFM, Supp Fan, SAT, CWS,CWR, CHW VLV, HWR, HWS, Heating VLV, CHW VLV, Ret Air Damper, AHU5 OA CFM, AHU RF-CFM Diff, AHU7 Sup Air Reset, AHU7 Supply Hi Limit, AHU7 Duct Static Press, AHU7 Night Setback, AHU7 Night Setup, AHU7 Mix Air Low Limit, AHU7 Supp, AHU5 Ret, Supply Duct Static Press, Actual Return CFM, Bldg Static Press
AHU 8- 2nd Lvl Mid	Ret Humid, RAT, Ret Fan, Damper Control Sig, Relief Damper, Ret CFM, OAT, OA Damper, Ret Air Damper, MAT, Coil Pump, OA CFM, Supp CFM, Supp Fan, SAT, CWS,CWR, CHW VLV, HWR, HWS, Heating VLV, CHW VLV, Ret Air Damper, AHU4 OA CFM, AHU RF-CFM Diff, AHU8 Sup Air Reset, AHU8 Supply Hi Limit, AHU8 Duct Static Press, AHU8Night Setback, AHU8 Night Setup, AHU8 Mix Air Low Limit, AHU8 Supp, AHU4 Ret, Supply Duct Static Press, Actual Return CFM, Bldg Static Press
AHU9- Auto	Ret Humid, RAT, Ret Fan, Damper Control Sig, Relief Damper, Ret CFM, OAT, OA Damper, Ret Air Damper, MAT, Coil Pump, OA CFM, Supp CFM, Supp Fan, SAT, CWS,CWR, CHW VLV, HWR, HWS, Heating VLV, CHW VLV, Ret Air Damper, AHU4 OA CFM, AHU RF-CFM Diff, AHU9 Sup Air Reset, AHU9 Supply Hi Limit, AHU9 Duct Static Press, AHU9Night Setback, AHU9 Night Setup, AHU9 Mix Air Low Limit, AHU9 Supp, AHU4 Ret, Supply Duct Static Press, Actual Return CFM, Bldg Static Press

Points on BAS Cont'd

MUA

Description	Points
MUA 8	OA Damper, SAT, MUA Low Temp Alarm, CHW VLV, CWS, CWR, Damper, EF 12, EF 13, EF14, EF 16, EF 17, EF occ Mode, MUA 8 Duct Static, MUA 8 Duct Static Hi Limit
MUA 9 Firing Range	RAT, Damper Control Sig, Relief Damper, Ret Fan, FreezeStat Status, MAT, Ret Air Damper, OAT, OA Damper, Space T, Remote Fan En, Sup Fan, SAT, CWR, CHW VLV,, CWS, Heating VLV, HWR, HWS, PreFilter Stat, Mid Filter Stat, Final Filter Stat, MUA 9 Sup Air, MUA9 Sup Hi Lim, MUA9 Mix Air lo Lim, Mua9 Damper Lockout, MUA 9 Damper Min Pos, MUA9 Wntr Sup Air, MUA 9 Summr Sup Air
MUA 2-Diesel	EF5, MUA2 CO2 Setpoint, MUA 2 NW CO2 Sensor, MUA 2 NE CO2 Senor, OA Damper, MUA2 So CO2 Sen, MUA Low Temp Alarm, SAT
MUA 3-Welding	EF11, OA Damper, MUA Lo Temp Alarm, SAT
MUA 4-Auto Lab	EF 8, MUA 4 CO Setpoint, MUA4 North CO Sensor, MUA4 South CO Sensor, SAT, MUA Low Temp Alarm, OA Damper
MUA1-Diesel Underfloor	EF4, MUA1 Space Static, OA Damper, MUA Lo Temp Alarm, SAT
MUA5-Auto Lab1	EF7, MUA5 CO Setpoint, MUA5 CO Sensor, OA Damper, MUA Lo Temp Alarm, SAT
MUA6-Auto Lab Underfloor	EF9, OA Damper, MUA Lo Temp Alarm, SAT, MUA 6 Space Static
MUA 7-Steam cleaning	EF6, OA Damper, MUA Lo Temp Alarm, SAT

Hot Water System

Description	Points
Secondary	HW Supply Temp, HW secondary Sup Press, HW Secondary Supp, HW Sec Return, HW Primary Ret, HW Secondary Supp Temp Setpoint, HW Primary Supp, HW Secondary Diff Press Setpoint, HW Secondary Diff Press, HW Secondary Ret Press, HW Pump1 Status, Pump Runtime Rest, HW Pump1, HW Pump 1 Runtime, HW Pump 1 Disable, HW Pump 2 Status, HW Pump 2 Status, HW Pump 2 Enable, HW Pump 2 Runtime, HW Pump3 Status, HW Pump3 En, HW Pump 3 Runtime

Points on BAS

Exhaust Fans with VFDs

Description	Points
EF24	Fan Status, Schedule Mode
EF 26	Fan Status, Schedule Mode

VAV Boxes

Description	Points
Entry VAV	Airflow Setpoint, Airflow Actual CFM, Heat/Cool Mode, Damper Pos, Reheat VLV, Room Temp, Room Setpoint

Chilled Water System

Description	Points
Secondary	CW Secondary Supp, CW Secondary Ret, CW Primary Ret, CW Secondary Supp Temp Setpoint, CW Secondary Supp, CW Secondary Diff Press Set Pt, CW Secondary Diff Press, CW Control VLV, CW Secondary Ret Press, CW Sec Supp Press, CW Ret temp, CW Pump 4 Stat, Pump runtime Reset, CW Pump 4 Disable, CW Pump 4 Runtime, CW Pump 5 Status, CW Pump5 Discharge, CW Pump 5 Runtime, CW Pump 6 Stat, CW Pump6 Discharge, CW Pump 6 Runtime

PE/Gym Building State ID# E26143C0569
Chiller Room, Electrical Room East, Heating Plant Addition (Building U)
State ID# E26143C0467, T0693, T0799
Athletics/Big Gym/Boiler Room State ID# E2614C0569
Maintenance Building State ID# E2614T0893

Area (sq ft)	44,855	Year Built	1967-99	EUI/Benchmark	65/162.75

HVAC Equipment

Air Handlers (7 Total)

Description	Type	Size	Notes
AHU 1 Gym	AHU	10 hp	
Multipurpose	AHU	2 hp	
Weight room	AHU	¾ hp	

Pumps (7 Total)

Description	Type	Size	Notes
Pump	Heating	¾ hp	
Pump	R&D	¾ hp	
Pump	Vent	½ hp	
Pump	Circ Wtr	1/12 hp	
Pump	Water	½ hp	
Pump	Water	1/6 hp	

Chilled Water System

Description	Type	Size	Notes
CHWP		60 hp, 800 gpm	1x
CHWP		40 hp, 1260 gpm	

Hot Water System

Description	Type	Size	Notes
HWP		10hp, 600gpm	3x
Boiler	Hot Water Boilers	(2X) 11716 kBtu/h	Runs 1wh per year for emergency and exercise. Has its own gas meter.

Unit Heater System

Description	Type	Size	Notes
UH1	Unit Heater	50.1 kBtu/h	
UH2	Unit Heater	39.5 kBtu/h	
UH 3	Unit Heater	23.5 kBtu/h	
UH 4	Unit Heater	28.1 kBtu/h	
UH 5	Unit Heater	44.5 kBtu/h	
UH 6	Unit Heater	12.8 kBtu/h	

HVAC Equipment Cont'd

Electrical operated equip System

Description	Type	Size	Notes
EF	Fan	1 ½ hp	
EF	Fan	1/6 hp	
VF-Gym	Vent Fan	10 hp	
VF-LR	Vent Fan	5 hp	

Points on BAS

Air Handlers

Description	Points
Locker Room AHU	OAT, MAT, DAT, OA&RA Damper Pos, HW VLV F&B Damper Pos, Locker AHU Schedule, MA Reset Setpoint, Discharge Setpoint, Locker Space Setpoint, Fan Start/Stop, Coil Pump S/S, Economizer Dampers, HW VLV/F&B Damper, AHU Fan Amps, Coil Pump Amps, Discharge Air Temp, MAT, Locker Space Temp, Freeze Alarm, Fail Alarm
Multipurpose AHU	OAT, MAT, DAT, OA & RA Damper Pos, HW VLV/ F&B Damper Pos, Coil Pump, PE AHU1 Schedule, MA Reset Setpoint, Multipurpose Setpoint, Fan Start/Stop, Coil Pump S/S, Econ En, Dis, Econ Damper, HW VLV, AHU Fan Amps, AHU Coil Pump, DAT, MAT, Multip Space Temp, Pump Fail Alm, AHU Freeze Alarm, AHU Fail Alarm
AHU1	OAT, MAT, DAT, OA&RA Damper Pos, HW VLV, Coil Pump, PE AHU1 Schedule, MA Reset Setpoint, Multip Setpoint, Fan Start/Stop, Coil Pump S/S, Econ En/Dis, Economizer Dampers, HW VLV, AHU Fan Amps, AHU Coil Pump, DAT, Mat, Multip Space temp, Pump Fail Alarm, AHU Freeze Alarm, AHU Fail Alarm

Hot Water System

Description	Points

Pumps

Description	Points
PE/Gym Pumps	Return Temp, Supply Temp, Rad Temp, Winter DHW Pump, Rad Pump, Heating L/O Setpoint, Rad Reset Setpoint, Rad Pump S/S, Elec HW Htr E/D, Winter Conv Pmp S/S, Stor Tank Pmp S/S, Dom HW Pmp S/S, Rad HW VLV, HW Supply T, HW Return T, Rad Supply T, Classroom Temp, Classroom Temp, Rad Pump Amps, Rad Pump Fail

Administration – Building M State ID# E26143C0167					
Area (sq ft)	12,520	Year Built	1967	EUI/Benchmark	65/162.75

HVAC Equipment

Air Handlers (7 Total)

Description	Type	Size	Notes
AHU	Pneumatic	3 HP	

Unit Heater System

Description	Type	Size	Notes
A1	Unit Heater	25.8 kBtu/h	
A2	Unit Heater	33.6 kBtu/h	
A3	Unit Heater	33.6 kBtu/h	
A4	Unit Heater	33.6 kBtu/h	
A5	Unit Heater	30.1 kBtu/h	

Unit Ventilators System

Description	Type	Size	Notes
A1	Ventilators	1500 cfm, 5.5 gpm	
A2	Ventilators	1500 cfm, 5.5 gpm	
A3	Ventilators	1500 cfm, 5.5 gpm	
A4	Ventilators	1000 cfm, 4.5 gpm	
A5	Ventilators	1000 cfm, 4.5 gpm	

Points on BAS

Air Handlers

Description	Points
AHU	Ad Master Schedule, Fin Aid Space SP, HR Space SP, General Space SP, Fin Aid Reheat, HR Reheat, AHU HW Coil, Fin Aid Space Temp, Fin Aid RH Disc T, HR Space Temp, HR RH Disc Temp, Stud Srv Space T, AHU Discharge T
AHU	Ad Master Schedule, Univent Pump1 S/S, Reheat Pump 2 S/S, Reheat Pump 4 S/S, Exhaust fan 1 S/S, Exhaust Fan 2 S/S, Building Lights, Sidewalk lights, Univent Pump 1, Reheat Pump 2, Reheat Pump4, Exh Fan 1 Status, Exh Fan 2 Status

Campus Center – Building G State ID# E26143C0774					
Area (sq ft)	12,370	Year Built	1974	EUI/Benchmark	65/162.75

HVAC Equipment

Air Handlers (7 Total)

Description	Type	Size	Notes
AHU1	AHU	3 HP	
AHU 2	AHU	1.5 HP	
AHU 3	AHU	10HP	

Compressor (1Total)

Description	Type	Size	Notes
Compressor		5HP	

Unit Heater System

Description	Type	Size	Notes
HWP	Pump	½ hp	

Points on BAS

Air Handlers

Description	Points
AHU 1	OAT, MAT, DAT, OA&RA Damper Pos, OA Damper, HW VLV/F&B Damper Pos, Coil Pump, CC AHU1 Schedule, MA Reset Setpoint, Discharge Setpoint, Space Setpoint, Damper Min Pos, Fan Start/Stop, Coil Pump S/S, Econ Dampers, HW VLV/F&B Damper, A/C Start/Stop, Discharge Temp, MAT, AHU Fan, Multi Media Temp, Coil Pump Status, Freeze Alarm, A/C Fail Alarm, Unit Fail Alarm
AHU 2	OAT, MAT, DAT, OA & RA Damper Pos, OA Damper, HW VLV/ F&B Damper Pos, Coil pump, CC AHU2 Schedule, MA Reset Setpoint, Discharge Setpoint, Space Setpoint, Damper Min Pos, Fan Start/Stop, Coil Pump S/S, Economizer Dampers, HW VLV F&B Damper, A/C Start/Stop, Discharge Temp, MAT, AHU Fans, Conference Temp, Coil Pump Temp, Coil Pump Status, Freeze Alarm, A/C fail Alarm, Unit Fail Alarm

Pumps

Description	Points
Pumps	Return Temp, Supply Temp, HW Pump1, HW Pump2,Heating L/O Setpoint, Rad Pump1 S/S, Rad Pump2 S/S, backup Pump, Lead Rad Pump, backup Pump Reset, HW Supply Temp, HW Return Temp, Rad Supply Temp, Rad Pump1 Amps, Rad Pump 2Amps, Pump Fail Alarm

PBEEEP Abbreviation Descriptions			
AHU	Air Handling Unit	HUH	Horizontal Unit Heater
BAS	Building Automation System	HRU	Heat Recovery Unit
CD	Cold Deck	HW	Hot Water
CDW	Condenser Water	HWDP	Hot Water Differential Pressure
CDWRT	Condenser Water Return Temperature	HWP	Hot Water Pump
CDWST	Condenser Water Supply Temp	HWRT	Hot Water Return Temperature
CFM	Cubic Feet per Minute	HWST	Hot Water Supply Temperature
CHW	Chilled Water	HX	Heat Exchanger
CHWRT	Chilled Water Return Temperature	kW	Kilowatt
CHWDP	Chilled Water Differential Pressure	kWh	Kilowatt-hour
CHWP	Chilled Water Pump	MA	Mixed Air
CHWST	Chilled Water Supply Temperature	MA Enth	Mixed Air Enthalpy
CRAC	Computer Room Air Conditioner	MARH	Mixed Air Relative Humidity
CUH	Cabinet Unit Heater	MAT	Mixed Air Temperature
CV	Constant Volume	MAU	Make-up Air Unit
DA	Discharge Air	OA	Outside Air
DA Enth	Discharge Air Enthalpy	OA Enth	Outside Air Enthalpy
DARH	Discharge Air Relative Humidity	OARH	Outside Air Relative Humidity
DAT	Discharge Air Temperature	OAT	Outside Air Temperature
DDC	Direct Digital Control	Occ	Occupied
DP	Differential Pressure	PTAC	Packaged Terminal Air Conditioner
DSP	Duct Static Pressure	RA	Return Air
DX	Direct Expansion	RA Enth	Return Air Enthalpy
EA	Exhaust Air	RARH	Return Air Relative Humidity
EAT	Exhaust Air Temperature	RAT	Return Air Temperature
Econ	Economizer	RF	Return Fan
EF	Exhaust Fan	RH	Relative Humidity
Enth	Enthalpy	RTU	Rooftop Unit
ERU	Energy Recovery Unit	SF	Supply Fan
FCU	Fan Coil Unit	Unocc	Unoccupied
FPVAV	Fan Powered VAV	UH	Unit Heater
FTR	Fin Tube Radiation	VAV	Variable Air Volume
GPM	Gallons per Minute	VFD	Variable Frequency Drive
HD	Hot Deck	VIGV	Variable Inlet Guide Vanes
HP	Horsepower	VUH	Vertical Unit Heater

Conversions:
1 kWh = 3.412 kBtu
1 Therm = 100 kBtu
1 kBtu/hr = 1 KBTU/H